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Front cover photo by © Mike Danzenbaker of Mountain View, California: Redwing (*Turdus iliacus*), Olympia, Washington, 3 January 2005.

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WESTERN BIRDS

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SHOREBIRD USE OF THE LOWER LOS ANGELES RIVER CHANNEL: A NOVEL WETLAND HABITAT

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ABSTRACT: The concrete-lined channel of the lower Los Angeles River in Long Beach supports one of the largest concentrations of shorebirds in southern California during fall migration. Each fall, the Black-necked Stilt (*Himantopus mexicanus*), Western Sandpiper (*Calidris mauri*), and Least Sandpiper (*Calidris minutilla*) occur in the thousands of individuals per day, and the American Avocet (*Recurvirostra americana*) and Long-billed Dowitcher (*Limnodromus scolopaceus*) occur in the hundreds. Numbers peak from mid-August through late September, and eight systematic surveys between 9 August and 27 September 2000 yielded in excess of 14,000 birds on four of these counts. Despite the channel's proximity to the coast, the species composition resembles that at other inland sites in the Southwest more closely than natural coastal wetlands in the region. Because of the channel's constricted concrete borders, even slight rainfall can raise the water level in the channel, reducing the suitability of the habitat for shorebirds. This effect likely accounts for the area's relatively light use by shorebirds outside the late summer and fall dry season.

As landscapes across the West become more urbanized, information on wildlife use of novel habitats will be at a premium. Shorebirds are receiving increased conservation attention, and strategies to incorporate their needs into wetlands management are being developed (Brown et al. 2001). The greater Los Angeles area was once a haven for waterbirds (Chambers 1936, Fuller 1955), but now only a handful of its much-reduced wetlands, split largely between the Oxnard Plain of coastal Ventura County (including Mugu Lagoon) to the north and the coastal marshes of Orange County to the south (Cooper 2004), are appropriate for shorebirds. Starting in the early 1900s, but greatly accelerating following catastrophic flooding in 1938, a large system of wetlands along the Los Angeles River (roughly traced by the path of Interstate freeway 405) in southern Los Angeles County was drained, and the water was diverted into cement-lined flood-control channels to allow for urban development (Gumprecht 1999:17–20, 224–228). Though small sections of the floor of the 85 km-long Los Angeles River were never lined and now support a mix of native and ruderal riparian vegetation (Wallace

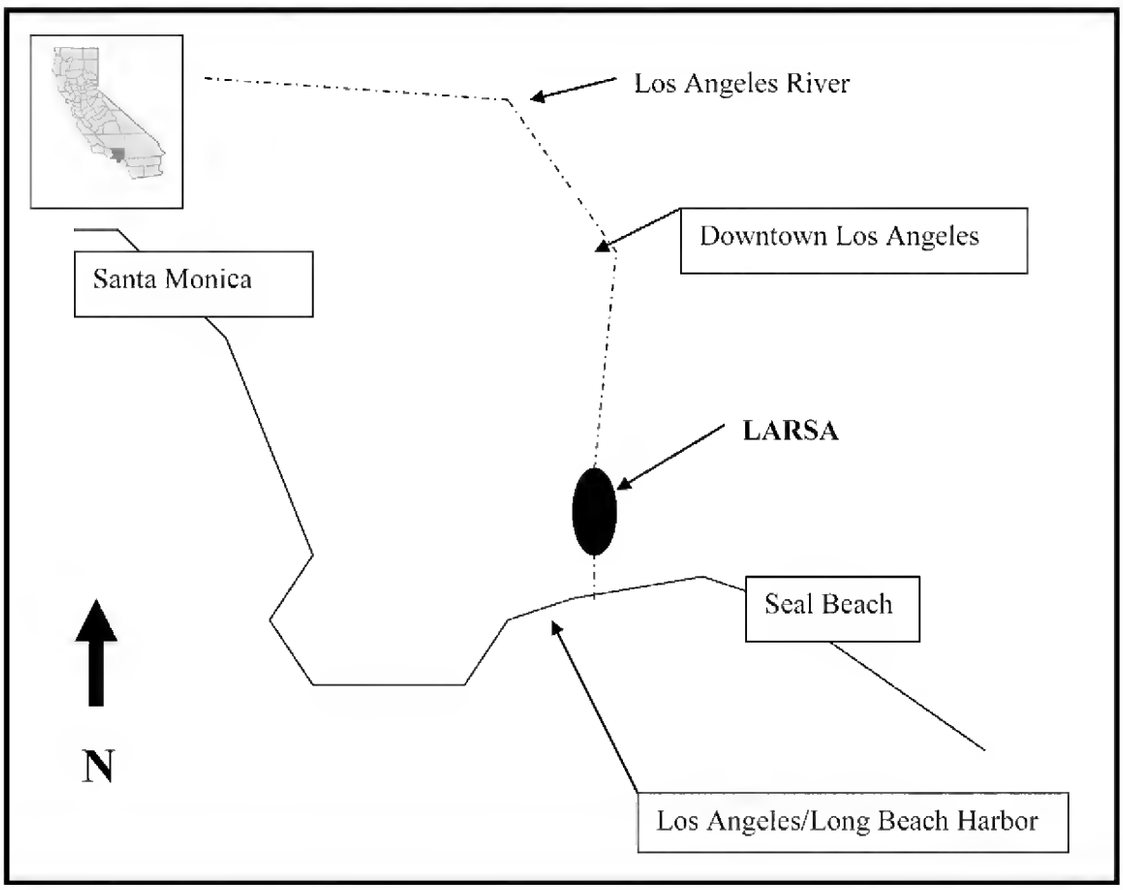

Figure 1. The Los Angeles River shorebird area (LARSA) in Los Angeles County.

1993), the 35-km stretch from downtown Los Angeles south to Willow Street in Long Beach is entirely lined with cement. Here, the channel floor is 100 m wide, and water flows year round, with 85% of the flow consisting of treated effluent from two wastewater-treatment plants upstream, 10% of urban runoff, and the remaining 5% of natural groundwater (Mullin 2000; V. Bapna, Los Angeles Dept. of Public Works, pers. comm.).

Though obviously different from the natural wetlands they replaced, portions of these cement channels have proven attractive to shorebirds, particularly a 13-km-long section of the Los Angeles River channel from Willow Street in north Long Beach upstream to Interstate freeway 105 in the city of Paramount (Figure 1; Garrett 1993, Cooper 2004:148). This "Los Angeles River Shorebird Area" (hereafter LARSA) is located just east of what were once two large historical wetlands, "Nigger Slough" in present-day Carson and Watson Lakes/Slough in northern Long Beach (Hise and Deverell 2000:254, Gumprecht 1999), both popular collecting locales for early Los Angeles ornithologists (Grinnell 1898, Willett 1912, 1933, Garrett 1993). LARSA represents 150 ha of contiguous linear habitat formed by a thin sheet of water (<10 cm deep) flowing across the floor of the trapezoidal channel, interrupted by exposed cement and clumps of herbaceous vegetation on silt bars. This sheet supports a mat of algae (*Cladophora* spp., *Scenesdesmus acuminatus*, *Pediastrum* spp., *Euglena* spp.) that develops through the summer (Anderson 1993). This algal mat supports flies, whose eggs and larvae offer abundant concentrated food for shorebirds. By October,

rains—even showers elsewhere in the Los Angeles Basin—raise the water level in the channel and wash out the algal growth, which can then re-form during intervals between winter storms (Garrett 1993:5; pers. obs.).

METHODS

To document the timing and magnitude of fall shorebird migration on the lower Los Angeles River, I organized a group of volunteers for eight single-day surveys of LARSA during August and September 2000. Teams of one or two experienced observers walked four consecutive sections within LARSA simultaneously between 0630 and 0900 hr to avoid duplicate counting, estimating total numbers of shorebirds seen within the channel and identifying birds to species where possible. In addition to these systematic surveys in 2000, I surveyed the southernmost 2.5 km of LARSA (between Interstate 405 and Willow St.) weekly in October and early November 2000 and 2001; I also made several incidental surveys on this southernmost stretch of LARSA in June/July 2001 to clarify usage during the early (mid-summer) period of shorebird migration, which was not covered by the comprehensive surveys in 2000. For one problematic group, the dowitchers, individuals were typically recorded as simply "dowitcher spp.," even though most dowitchers on the river after August are assumed to be Long-billed (*fide* K.L. Garrett), and small numbers of the Short-billed were recorded (by voice) on the eight fall surveys in 2000 (Table 1).

RESULTS AND DISCUSSION

Twenty-two species of shorebirds were detected on the eight surveys of LARSA in 2000 (Table 1); at least 11 additional species are known from the site (Garrett 1993; K. L. Garrett pers. comm.). The total number of shorebirds approached or exceeded 15,000 on four of the eight surveys and exceeded 15 species on all six surveys between 16 August and 20 September. (Table 1). A dip in the numbers of birds on the 30 August count coincided with a rise in water levels in the channel following a tropical storm on 29 August (pers. obs.). These storm waters may have cleared out some of the algal growth, temporarily reducing habitat for shorebirds and reflected in their reduced abundance on 9 September. Additional surveys in late fall and winter (Table 2) not only clarified which species were transients as opposed to wintering residents at the site (e.g., Black-bellied Plover), they also revealed a dramatic reduction in the numbers of the Killdeer, American Avocet, and dowitchers, presumably as migrants of these species moved on to wintering locales. Supplemental surveys in summer 2001 (Table 3) revealed high usage by certain species earlier than the August start date of the 2000 surveys, suggesting that future shorebird surveys at LARSA be initiated in mid-July.

The numbers of shorebirds using LARSA are comparable to those at other sites important to shorebirds in southwestern California (see Hickey et al. 2003), at least during fall migration. Eleven species of shorebirds were recorded on all eight counts in fall 2000, with the three most abundant species, the Black-necked Stilt, Western Sandpiper, and Least Sandpiper,

Table 1 Counts of Shorebirds along the Los Angeles River between Interstate 105 and Willow Street, Fall 2000

Species	9 Aug	16 Aug	23 Aug	30 Aug	6 Sep	13 Sep	20 Sep	27 Sep
Black-bellied Plover *Pluvialis squatarola*	29	19	5	4	15	18	15	1
Semipalmated Plover *Charadrius semipalmatus*	36	41	37	4	15	23	15	4
Killdeer *Charadrius vociferus*	45	45	34	4	41	61	45	32
Black-necked Stilt *Himantopus mexicanus*	3501	3840	4215	2449	2488	3836	3968	3353
American Avocet *Recurvirostra americana*	65	23	125	81	90	110	174	79
Greater Yellowlegs *Tringa melanoleuca*	17	17	23	13	8	15	14	16
Lesser Yellowlegs *Tringa flavipes*	7	13	15	11	12	10	12	2
Solitary Sandpiper *Tringa solitaria*	0	0	0	0	0	0	0	1
Willet *Catoptrophorus semipalmatus*	0	0	1	0	0	0	1	0
Spotted Sandpiper *Actitis macularius*	2	5	5	6	11	6	8	6
Semipalmated Sandpiper *Calidris pusilla*	0	5	0	0	0	0	0	0
Western Sandpiper *Calidris mauri*	4189	6826	7253	4115	4773	9091	8664	4308
Least Sandpiper *Calidris minutilla*	1880	3807	2759	1477	1370	2658	1838	1356
Baird's Sandpiper *Calidris bairdii*	0	1	3	2	1	1	1	0
Pectoral Sandpiper *Calidris melanotos*	0	0	1	0	2	10	6	0
Dunlin *Calidris alpina*	0	0	0	0	0	0	1	0
Short-billed Dowitcher *Limnodromus griseus*	5	2	0	13	9	3	0	1
Total dowitchers *Limnodromus* spp.	278	374	581	373	404	553	626	623
Wilson's Phalarope *Phalaropus tricolor*	23	44	39	26	3	1	0	0
Red-necked Phalarope *Phalaropus lobatus*	0	4	14	12	1	2	0	0
Red Phalarope *Phalaropus fulicarius*	0	0	0	1	0	0	0	0
Total individuals	10,077	15,062	15,110	8591	9243	16,398	15,388	9782
Total species	13	16	16	16	16	16	15	13

Table 2 Counts of Shorebirds along the Los Angeles River between Interstate 405 and Willow Street, late Fall/Winter 2000 and 2001

	2000					2001					
Species	7 Oct	14 Oct	28 Oct	4 Nov	25 Nov	6 Jan	6 Oct	13 Oct	28 Oct	1 Nov	13 Nov
Black-bellied Plover *Pluvialis squatarola*	0	3	1	0	0	0	5	3	0	0	0
Semipalmated Plover *Charadrius semipalmatus*	3	1	0	0	0	0	0	4	0	0	0
Killdeer *Charadrius vociferus*	18	21	54	1	0	2	24	22	10	3	5
Black-necked Stilt *Himantopus mexicanus*	963	799	535	654	746	567	718	516	663	554	225
American Avocet *Recurvirostra americana*	107	199	2	4	9	57	139	100	108	27	0
Greater Yellowlegs *Tringa melanoleuca*	5	6	0	0	0	0	10	9	8	7	2
Lesser Yellowlegs *Tringa flavipes*	0	1	0	0	0	0	1	0	0	0	0
Willet *Catoptrophorus semipalmatus*	0	1	1	0	0	0	1	1	1	0	2
Spotted Sandpiper *Actitis macularius*	2	3	2	2	2	1	7	4	6	1	3
Sanderling *Calidris alba*	0	0	0	0	0	4	0	0	0	0	0
Western Sandpiper *Calidris mauri*	515	330	0	126	1063	1860	40	570	25	0	40
Least Sandpiper *Calidris minutilla*	209	820	105	493	244	1160	180	510	202	0	180
Pectoral Sandpiper *Calidris melanotos*	0	0	0	0	0	0	1	1	0	0	0
Dunlin *Calidris alpina*	8	5	0	9	9	2	0	8	6	0	0
Ruff *Philomachus pugnax*	1	0	0	0	0	0	0	0	0	1	0
Dowitchers *Limnodromus* spp.	566	469	54	3	41	29	856	895	846	526	185
Wilson's Snipe *Gallinago delicata*	0	0	0	0	0	0	0	0	1	0	0
Red-necked Phalarope *Phalaropus lobatus*	0	0	0	0	0	0	1	0	0	0	0
Total individuals	2397	2658	754	1292	2114	3682	1983	2643	1876	1119	642
Total species	11	13	8	8	7	8	13	13	11	7	8

Table 3 Counts of Shorebirds along the Los Angeles River between Interstate 405 and Willow Street, Summer 2001

Species	26 Jun	12 Jul	25 Jul	12 Aug
Black-bellied Plover *Pluvialis squatarola*	0	0	4	0
Semipalmated Plover *Charadrius semipalmatus*	0	0	3	6
Killdeer *Charadrius vociferus*	0	2	7	14
Black-necked Stilt *Himantopus mexicanus*	521	549	808	980
American Avocet *Recurvirostra americana*	24	0[a]	38	112
Greater Yellowlegs *Tringa melanoleuca*	0	5	2	2
Lesser Yellowlegs *Tringa flavipes*	0	1	0	0
Semipalmated Sandpiper *Calidris pusilla*	0	0	0	1
Western Sandpiper *Calidris mauri*	0	250	932	1845
Least Sandpiper *Calidris minutilla*	0	110	401	438
Dowitchers *Limnodromus* spp.	0	0	109	475
Wilson's Phalarope *Phalaropus tricolor*	0	0	6	3
Total individuals	545	917	2310	3876
Total species	2	6	10	10

[a]Probably overlooked on this date and in error.

exceeding 1000 birds on all eight surveys (Table 1). Despite approaching the coast as close as 6 km, LARSA supports a bird community resembling that of other inland-basin flood-control channels more closely than that of coastal wetlands. For example, along the San Gabriel River near Whittier Narrows, 50 km from the coast, some species abundant in southern California coastal wetlands such as the Willet and Marbled Godwit (*Limosa fedoa*) are rare, and in fall the most common shorebirds are the Killdeer, Black-necked Stilt, Greater Yellowlegs, Western Sandpiper, Least Sandpiper, and Long-billed Dowitcher (Long 1993). With its large numbers of the Black-necked Stilt and small *Calidris* sandpipers, the shorebird avifauna of LARSA also appears similar to that at wastewater-treatment ponds and shallow reservoirs elsewhere in California (W. D. Shuford in litt.). More information on the ecology of migrant and wintering shorebirds at LARSA would be desirable, including seasonal changes in foods, possible effects of pollution (from urban runoff), the relationship between the water level in the channel and the distribution and abundance of shorebirds here and elsewhere along the channel, and the actual status of the two dowitcher species. Future reduction of summer and fall water levels in the river (through water conservation) could lead to major changes in the use of this site by shorebirds.

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FIRST NEST OF THE YELLOW-BELLIED FLYCATCHER FOR ALASKA, WITH NOTES ON BREEDING BIOLOGY

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ABSTRACT: We discovered a breeding population of Yellow-bellied Flycatchers (*Empidonax flaviventris*) during the summer of 2004 in a mountainous area northwest of Fairbanks, Alaska. A minimum of 13 males, all apparently paired, were defending territories in open montane forest with patches of thick alder, birch, and willow. Expanses of similar unsurveyed habitat suggested the possibility of a much larger population. A nest with four eggs provided the first evidence of this species' breeding in Alaska. We recorded behavior at this nest by 24-hour videotaping during incubation and when nestlings were 1 and 8 days old. The nestlings fledged after 15 days. This information extends the known breeding range of the Yellow-bellied Flycatcher west of Canada for the first time and, with other sites of suspected breeding, suggests the species may have a broader breeding distribution in Alaska, particularly in remote stretches of the Yukon River drainage.

The breeding range of the Yellow-bellied Flycatcher (*Empidonax flaviventris*) extends from the boreal forests in the higher elevations of the Appalachian Mountains north through the northeastern United States to the boreal forests of Canada, from Newfoundland to Yukon Territory (Gross and Lowther 2001). The first Alaska record, of an adult female on 28 July 1966 at the confluence of Coal Creek and the Yukon River (White and Haugh 1969), remained unique for 20 years. Beginning in the mid 1980s, there were occasional records of singing males and migrants from several locations in the state (Table 1). In the early 1990s, when Breeding Bird Surveys were initiated along the roads of interior Alaska (Tobish 2004), a few Yellow-bellied Flycatchers began to be found almost annually north of the Alaska Range in east-central Alaska (Benson et al. 2000; Table 1). At the end of the 20th century, Benson et al. (2000:102) postulated a recent range expansion of this species into east-central Alaska, where "now known as a possible breeder and rare fall visitant," based on nine individuals netted in August (1993–1998) and 18 records in June (1992–1998) (Benson et al. 2000:102; Table 1).

On 19 June 2004, while surveying for sites suitable for studying breeding of the Alder Flycatcher (*Empidonax alnorum*), Gray-cheeked Thrush (*Catharus minimus*), and White-crowned Sparrow (*Zonotrichia leucophrys*), Martin and Bonier discovered a population of the Yellow-bellied Flycatcher northwest of Fairbanks. The site was located along the Rampart Road near Eureka, approximately 9.5 km north of the junction with the

Table 1 Published records of the Yellow-bellied Flycatcher in Alaska

Location	Date	Number of birds	Reference; specimen number[a]
Near the confluence of Coal Creek and Yukon River	28 Jul 1966	2 individuals (1 ad. female)	White and Haugh 1969; UAM 3078
Chitina area	21–29 Jun 1986	1 singing male	*Am. Birds* 49:1243, 1986
Hyder	18 Jun 1989	1 individual	*Am. Birds* 43:1356, 1989
Colville River delta	6 Sep 1989	1 immature male	UAM 7060
Hyder area	24–25 Jun 1990	1 singing male	*Am. Birds* 44:1172, 1990
Richardson, Taylor, and Alaska highways	10–28 Jun 1992–98	singing males/ 2–9 yr, 18 total	Benson et al. 2000; UAM 6576
Mitkof Island	23–25 Jun 1993	1 adult male	*Am. Birds* 47:1140, 1993; UAM 6366
Fairbanks	20 Aug 1993	1 immature female	Benson et al. 2000; UAM 6373
Chitina area	15 Jun 1994	1 individual	*Field Notes* 48:977, 1994
Tok area	4 Aug 1994	1 individual	Benson et al. 2000
Tok area	8 Aug 1994	1 immature male	Benson et al. 2000; UAM 6579
Tok area	16 Aug 1994	1 individual	Benson et al. 2000
Northway: 45 km southwest	27 Jun 1995	1 singing male	*Field Notes* 49:965, 1995
Fairbanks	17 Jun 1996	1 individual	*Field Notes* 50:984, 1996
Tok area	23 Aug 1996	1 immature	Benson et al. 2000
near Skagway	12 Jun 1997	1 calling	*Field Notes* 51:1038, 1997
Fairbanks	13 Aug 1997	1 immature female	Benson et al. 2000; UAM 7427
Fairbanks	15 Aug 1997	1 individual	Benson et al. 2000
Tok area	27 Aug1998	1 individual	Benson et al. 2000
Tok area	22 Jun 2000	1 individual	*N. Am. Birds* 54:413, 2000
Fairbanks	11 Aug 2001	1 individual	*N. Am. Birds* 56:91, 2002
Alaska Hwy near Canadian border	7 Jun 2004	2 individuals	*N. Am. Birds* 58:419, 2004
Juneau	29 Jun–4 Jul 2004	1 individual	*N. Am. Birds* 58:584, 2004
9.5 km north of the Elliott Hwy on Rampart Rd.	Jun–Jul 2004	13+ pairs	*N. Am. Birds* 58:584, 2004; this paper

[a]UAM, University of Alaska, Fairbanks.

Elliott Highway (locally known as Deadhorse Pass, Minook Valley; 65.23° N, 150.18° W, 585 m elevation). During field work at this site we heard at least 13 different males either countersinging or singing from sites at least 100 m apart. We made no attempt to survey farther afield, but apparently similar habitat extends in all directions from the site, suggesting the possibility of a substantial population.

Most if not all males probably paired and bred, as suggested by a general reduction in song rates over the season and the persistence of similar numbers of birds into July. We located a nest with four eggs on 30 June 2004, the first nest of the Yellow-bellied Flycatcher recorded in Alaska. Here we provide details of the breeding biology of the Yellow-bellied Flycatcher based on observations and measurements made at this nest, in addition to more general observations on this population's habitat use.

Figure 1. Habitat of nesting Yellow-bellied Flycatchers near Eureka, Alaska. Territories were located primarily in the gullies wooded with deciduous trees interspersed by tundra (background), with few individuals occupying mixed coniferous woodland (foreground).

Figure 2. Habitat within the territory of the nest described in this paper. Note the thickets dominated by alder (*Alnus crispa*), willows (*Salix* spp.), and birch (*Betula* spp.), and the interspersed areas of open tundra.

METHODS

We used a Hi-8-mm video camera to record the behavior at the nest, placing the tripod and camera approximately 8 m from the nest and concealing them with vegetation. The female did not flush from the nest during visits to change tapes, and we noted no responses to the camera or tripod. We

Figure 3. Yellow-bellied Flycatcher nest containing four eggs, 30 June 2004. This represents the first nest for Alaska and a westward extension of the breeding range of the species.

used an Acculab (PP2060D) portable scale and 50.0-g reference weight to measure the mass of eggs, nestlings, and nest components. We used calipers to measure nest, eggs, and nestlings and recorded vegetation by using Hultén (1968) as a reference. Descriptions of egg shape and markings follow Harrison (1979), while descriptions of nestlings' plumage development follow the feather-tract nomenclature of Clench (1985).

RESULTS

General Habitat Use

Yellow-bellied Flycatchers were found in open montane forest with patches of thicker vegetation and a thick ground cover of moss and lichen, at elevations from 200 to 600 m (Figure 1). Dominant tree species included the green mountain alder (*Alnus crispa*), the paper birch (*Betula papyrifera*), the willows *Salix phylicifolia planifolia*, *S. alaxensis*, *S. bebbiana* (= *S. depressa*), and, in lower-elevation territories, the white spruce (*Picea glauca*) and, to a lesser extent, the black spruce (*P. mariana*), with scattered black cottonwood (*Populus balsamifera*) and quaking aspen (*P. tremuloides*) throughout. Shrub layers were patchy and composed of willow and alder saplings and the northern red currant (*Ribes triste*) in the thick deciduous thickets, dwarf birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), and Alaska spiraea (*Spiraea beauverdiana*) in brushy open forest, and *Salix brachycarpa* and young *Betula papyrifera*. Ground cover in the open tundra was dominated by the low-bush cranberry (*Vaccinium vitis-idaea*), *V. uliginosum*, black crowberry (*Empetrum nigrum*), and Labrador tea (*Ledum palustre*).

Breeding Bird Community

Over the course of field work at this site, we observed the following species within 500 m of Yellow-bellied Flycatcher territories: Green-winged Teal (*Anas crecca*), Bufflehead (*Bucephala albeola*), Ruffed Grouse (*Bonasa umbellus*), Spruce Grouse (*Falcipennis canadensis*), Willow Ptarmigan (*Lagopus lagopus*), Sharp-shinned Hawk (*Accipiter striatus*), Red-tailed Hawk (*Buteo jamaicensis*), Peregrine Falcon (*Falco peregrinus*), Solitary Sandpiper (*Tringa solitaria*), Spotted Sandpiper (*Actitis macularius*), Herring Gull (*Larus argentatus*), Olive-sided Flycatcher (*Contopus cooperi*), Alder Flycatcher, Hammond's Flycatcher (*Empidonax hammondii*), Gray Jay (*Perisoreus canadensis*), Common Raven (*Corvus corax*), Tree Swallow (*Tachycineta bicolor*), Violet-green Swallow (*T. thalassina*), Bank Swallow (*Riparia riparia*), Black-capped Chickadee (*Poecile atricapillus*), Boreal Chickadee (*P. hudsonica*), Ruby-crowned Kinglet (*Regulus calendula*), Townsend's Solitaire (*Myadestes townsendi*), Gray-cheeked Thrush, Swainson's Thrush (*C. ustulatus*), American Robin (*Turdus migratorius*), Varied Thrush (*Ixoreus naevius*), Bohemian Waxwing (*Bombycilla garrulus*), Orange-crowned Warbler (*Vermivora celata*), Yellow Warbler (*Dendroica petechia*), Yellow-rumped Warbler (*D. coronata*), Northern Waterthrush (*Seiurus noveboracensis*), Wilson's Warbler (*Wilsonia pusilla*), Fox Sparrow (*Passerella iliaca*), Lincoln's Sparrow (*Melospiza lincolnii*), White-crowned Sparrow, Dark-eyed Junco (*Junco hyemalis*), Pine Grosbeak (*Pinicola enucleator*), White-winged Crossbill (*Loxia leucoptera*), Common Redpoll (*Carduelis flammea*), and Pine Siskin (*C. pinus*).

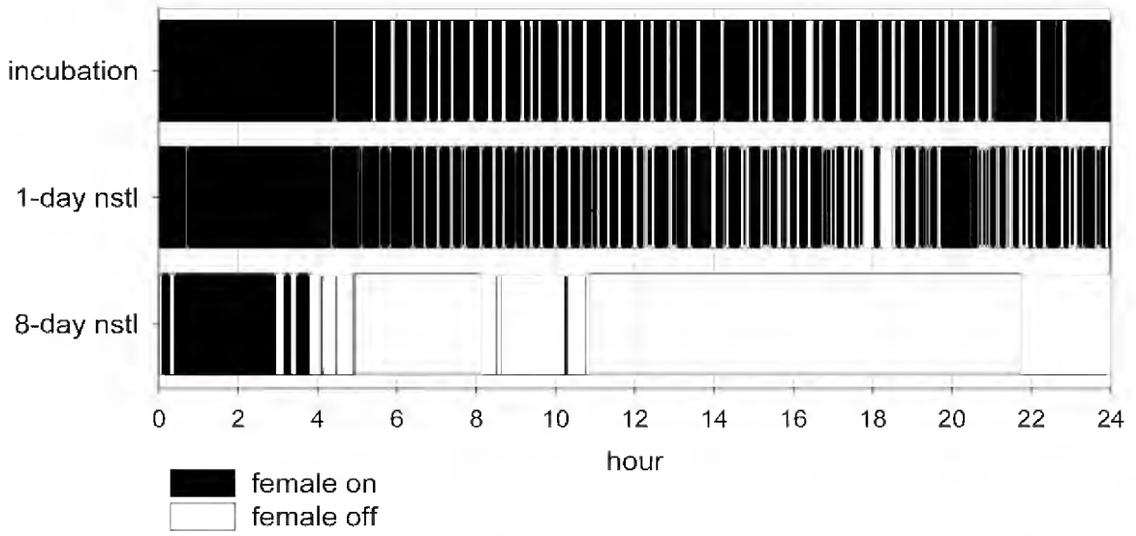

Figure 4. Incubation and brooding behavior at the Yellow-bellied Flycatcher nest over three 24-hour periods (midnight to midnight), during incubation, when the nestlings were 1 day old, and when they were 8 days old.

Figure 5. Yellow-bellied Flycatcher nestling on its day of hatching, when only hours old.

Figure 6. Yellow-bellied Flycatcher nestling 4 days old.

Figure 7. Yellow-bellied Flycatcher nestling 6 days old.

Figure 8. Yellow-bellied Flycatcher nestling 9 days old.

Figure 9. Yellow-bellied Flycatcher nestlings14 days old. Three nestlings successfully fledged on 20 July 2004, after a 15-day nestling period.

Nest

Site. The nest was located on the ground, at the base of small sapling *Salix* sp. and *Alnus crispa* growing together, on a steep mossy embankment (Figures 2, 3). It was built in a small depression on a west-facing slope of approximately 45°, in a dense patch of alder, paper birch, and willows growing below a road cut.

Structure and Composition. Nest measurements were made on 30 June 2004 during incubation (prior to nest expansion by growing nestlings): inner cup 5.0 × 5.0 cm, outer cup 12.0 × 11.5 cm; cup depth 3.5 cm; nest depth 6.0 cm. After the young fledged, we collected, dried, and weighed the nest (8.68 g). It consisted of *Lycopodium* spp. moss (including leaves, stalk, and rootlets; 6.70 g or 77.1%), dried grass (1.01 g or 11.6%), dead leaves (mainly small bits; 0.47 g or 5.4%), thin bark strips (0.25 g or 2.8%), very small twigs (0.12 g or 1.4%), black rootlet-like material (0.07 g or 0.8%), and moose (*Alces alces*) hair (0.07 g or 0.8%). The nest did not contain any feathers.

Eggs

On 30 June at 15:30 ADT, 5 days prior to hatching, the four eggs measured 17.9 × 13.4 mm (1.491 g), 18.0 × 13.7 mm (1.544 g); 18.6 × 13.7 mm (1.640 g), and 17.9 × 13.3 mm (1.538 g). We estimated the eggs' water loss by weighing them 4 days later, finding a mean loss of 0.0131 g per 24 hours (range 0.0119–0.0146 g per 24 hours). The eggs were somewhat short and oval (Harrison 1979) and were generally white with bold rufous-brown blotches concentrated in a thick wreath around the larger end of the egg, giving way to mostly white at the extreme tip of the large end of the egg. Scattered rufous-brown speckles and blotches were found over most of the eggs, declining in frequency towards the small end, which was almost free of speckling (Figure 3).

Incubation Behavior

We recorded behavior at the nest over a 24-hour period (midnight to midnight) on 2 July (Figure 4). Incubation during this interval was by only one bird, presumed to be the female on the basis of vocalizations and previous reports of exclusively females incubating in this species (Gross and Lowther 2001). Despite 24 hours of available daylight, the female went into a nocturnal phase of incubation between 22:53 and 04:25. During this time, the female incubated constantly, but activity on the nest continued every 15–25 minutes in the form of egg turning, preening, and the incubating bird's adjusting her position on the nest. At 04:25 the female began her series of regular bouts on and off the nest that continued throughout the day. Her mean bout on the nest (excluding the night bout) was 21.1 minutes (range 3.7–67.3 minutes); the mean bout off the nest was 5.0 minutes (range 0.78–10.82 minutes). Overall, the female spent 84.3% of the 24 hours on the nest (79.6% of the time excluding the nocturnal phase). The male did not feed the female on the nest. The male did, however, come to within 20–25 cm of the nest regularly, looking in at the female incubating, and he frequently chased the female as she left the nest. The male also moved with the female during some of her time off the nest as she foraged, and the

pair called to one another regularly, particularly as the female left the nest. The female's intervals spent on and off the nest did not vary much through the day, with the exception of early and late bouts on the nest, which were longer (Figure 4). On two occasions the female spotted something (not visible on video) that audibly stirred dead leaves near the nest. Then she flew from the nest and began snapping her bill rapidly. After 1 to 2 minutes, she returned to the nest and stayed on it for over 1 hour (first time) and for the rest of the night (second time). Extended bouts of incubation in response to a predator are known in other species (Tewksbury et al. 1999), and the 67.3-minute bout of incubation following the one disturbance may have reflected this response.

Nestlings

Three of four eggs hatched on 5 July, sometime before 19:00 ADT. One nestling had matted, moist down at 19:00, suggesting afternoon hatching. Despite having just hatched, the nestlings made soft high-pitched begging calls. One egg did not hatch, and we collected it on 6 July. Preparation revealed an embryo 2 mm long. This egg was deposited at the Burke Museum, University of Washington. We weighed, measured the tarsus, and assessed the development of all three nestlings on hatch day and when they were 4, 6, and 9 days old. On the day of hatching the nestlings were orange-pink with a yellow gape and eyes closed. They were naked ventrally with extensive dark gray down up to 9 mm long on the crown, sparse dark gray down on the back of the head, nape, and upper portions of wings and back. Their bills, wings, tarsi, feet, and cloacas were yellow. Their weights were 1.40, 1.41, and 1.52 g; their tarsi all measured 6 mm (Figure 5).

At the age of 4 days the nestlings' plumage had developed as follows: pteryla capitalis, very short dark gray pins beginning to emerge; pteryla spinalis, short gray pins emerging; pteryla ventralis, short yellow pins flanked by gray anteriorly; pteryla humeralis, short dark gray pins emerging, longer than body pins, including pins of primaries and secondaries (primary pins 1 mm); pteryla cruralis, a few dark gray pins beginning to emerge; pteryla caudalis, virtually nothing apparent; down still present, although less dense, on crown, and sparse on back of head, nape, back, and upper portions of wing; bill, gape, tarsi, feet, and cloaca yellow; eyes closed; skin generally pink. Measurements (mass, tarsus): 5.44 g, 11 mm; 5.82 g, 10 mm; 6.17 g, 10 mm (Figure 6).

At the age of 6 days the nestlings had progressed as follows: pteryla capitalis, dark gray pins grown in but sheaths not broken; pteryla spinalis, dark gray pins grown in, white at tips but sheaths not broken; pteryla ventralis, long yellow pins grown in but sheaths not broken, gray on sides of breast; pteryla humeralis, dark gray pins present on coverts and primaries and secondaries but no sheaths broken (primary pins 9 mm; likely broke their sheaths at the tips at 7days of age); pteryla cruralis, sparse dark gray and yellow pins present, sheaths not broken; pteryla caudalis, short (3 mm) dark gray pins present, sheaths unbroken; sparse dark gray down still present on either side of crown pins, and sparse on back of head, nape, back, and upper portions of wing; bill and gape yellow, with darker tones on maxilla; tarsus mauve, feet yellow-mauve, and cloaca pinkish yellow; eyes open some of the time; skin generally pink. Measurements (mass, tarsus): 8.36 g, 14

mm; 8.41 g, 14 mm; 9.31 g, 14 mm (Figure 7).

At the age of 9 days the nestlings' development was as follows: pteryla capitalis, dark gray pins breaking their sheaths on back of head and nape but not on forehead or anterior crown; pteryla spinalis, dark gray pins half broken from their sheaths along back; pteryla ventralis, long yellow pins one-half to two-thirds broken from their sheaths, gray on sides of breast; pteryla humeralis, coverts one-half broken from their sheaths, showing dark gray and buff wing bars; primary and secondary pinfeathers broken from their sheaths 2–3 mm; pteryla cruralis, sparse pins beginning to break from sheaths; pteryla caudalis, short (8–10 mm) dark gray pins breaking from sheaths at tips; sparse dark gray down on head and nape; down on back still present but hardly noticeable; mandible and gape yellow; maxilla dark gray; tarsus and feet dark gray, giving way to mauve and then yellow on posterior sides and soles; cloaca pink, ringed with small yellow feathers in the process of breaking from sheaths; eyes primarily open; skin generally dark pink. Measurements (mass, tarsus): 11.23 g, 18 mm; 12.28 g, 19 mm; 13.14 g, 18 mm (Figure 8). Video revealed nestlings stretching and flapping wings in the nest at 8 days. The nestlings were alert when measured at 9 days (primary pin feathers broken from their sheaths 2–3 mm), and one attempted to fledge. All were replaced, and all remained in the nest until 20 July: a 15-day nestling period. Although we did not measure the nestlings after an age of 9 days, we photographed them at 14 days (Figure 9). At this stage the young were alert and resembled the adults in plumage except for their short tails, yellow gapes and brighter plumage color, particularly noticeable in the yellow on the breast (and probably belly).

Nestling-Feeding Behavior. We videotaped the nest for 24-hour periods on 6 July (nestlings 1 day old) and on 13 July (nestlings 8 days old), within a day of the primary pinfeathers' first breaking from their sheaths. Both adults fed the nestlings frequently, making 180 feeding trips on 6 July and 468 trips on 13 July (over 24 hours) (Figure 10). A video clip of the nestlings being fed can be viewed at the Yanayacu Natural History Research Group's website (http://depts.washington.edu/nhrg/).

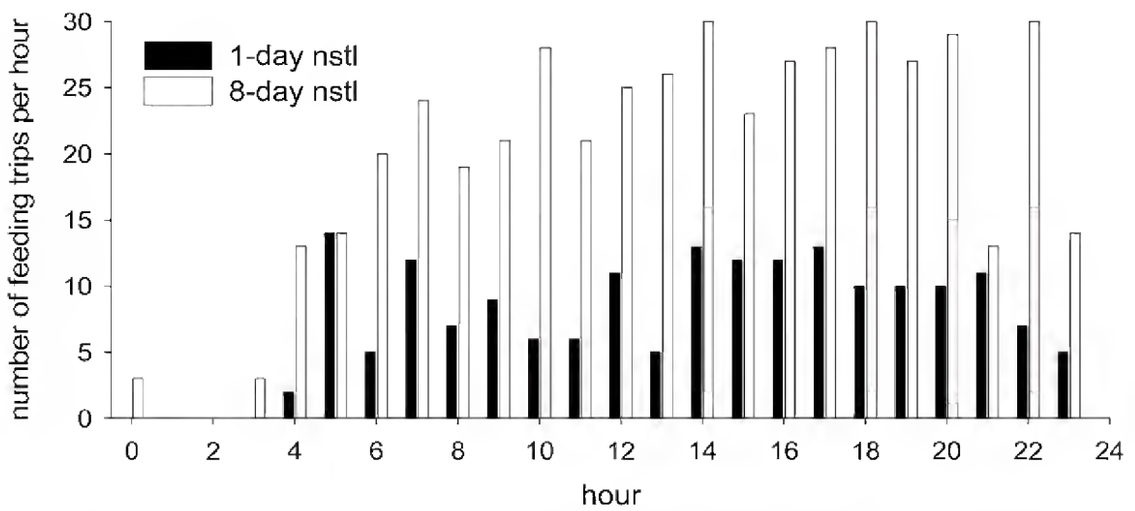

Figure 10. Hourly feeding rates of 1-day-old (black bars) and 8-day-old (white bars) nestlings. Trips include both male's and female's combined.

Fecal-Sac Removal. When the nestlings were 1 day old, the adults ate all fecal sacs the young excreted. We could not ascertain the rate of fecal-sac production at this stage from video. When the nestlings were 8 days old, the adults removed all fecal sacs from the nest, carrying them away. We do not know the outcome of fecal sacs once carried from the nest, although we suspect they were not eaten. The adults carried off 59 fecal sacs over the 24 hours we videotaped the 8-day-old nestlings, with no fecal sacs from midnight to 04:19, followed by 1–6 fecal sacs per hour through the rest of the day to midnight (average 2.95 per hour from 04:00 to 24:00).

Adults' Behavior at Nest

Nest-Probing Behavior and Ectoparasites. During the incubation and nestling periods, the female was observed to probe the nest lining at regular intervals. This probing occasionally became rapid, like a sewing machine in frequency, but more regularly consisted of several rapid probes into the nest lining alternated with staring. Such probing behavior has been observed in other passerines and is hypothesized to function in parasite removal (Dobbs et al. 2003). While we did not quantify the probing rate during nest watches in general, we did quantify it during a 1-hour interval (08:00–09:00) with 8-day-old nestlings as an example. During this hour, the female probed the nest on four occasions, spending a total of 116 seconds either staring into the nest or probing the nest lining.

We did not witness any ectoparasites in the nest or on the nestlings during our measurements of nestling growth. After collecting the nest, however, we found an abundance of red mites (Arachnida: Acari) in the lining of the nest; they appeared to leave the nest in response to the warmth of our hands. As we had not looked for mites specifically during nestling measurements, they could have been present on nestlings or in the nest throughout the nesting period.

Nest Defense. On two occasions during incubation, and on three occasions during videotaping of 1-day-old chicks, the female flushed off the nest in response to a disturbance. During all of these events, stirring of the leaf litter was audible on the tape, and a small rodent was observed to flush the female on two of the occasions. On all occasions, the female flushed and immediately began periodic rapid bill-snapping, likely associated with flights at the potential threat. We observed similar behaviors during our visits to the nest, particularly later in the nestling period, when the female approached us to < 1 m and snapped her bill during short flights around the nest.

Other Behaviors. When the nestlings were 1 day old, the male frequently gave food to the brooding female, who then fed the young. When the male came to feed while the female brooded, he passed the food to the female on eight occasions, and on another six occasions he fed the nestlings directly, underneath the female. Passing of food between parents was not observed later in the nestling period (8-day-old nestlings).

The adults were not observed adding material to the nest during the incubation or nestling periods, but they were observed occasionally removing material. When the nestlings were 1 day old, adults left the nest on one occasion with a piece of dry grass, on another occasion with a piece of dead

leaf. When the nestlings were 8 days old, an adult removed a small stick. No other removals of material were noted during observations.

Food and Foraging. We could not identify food brought to the nest, except for some dark brown moths and winged insects. We observed the adults foraging on several occasions, when they foraged primarily within 2 m of the ground in thick stands of mixed alder, willow, and birch. The adults sally-gleaned (Remsen and Robinson 1990), taking prey (presumably arthropods) from leaves and then flying to a new perch nearby. Territorial males frequently sang from isolated tall *Betula papyrifera* but were infrequently observed foraging there.

Interactions with Other Species. Three species of *Empidonax* flycatchers defended territories at our field site. On 22 June, a male Hammond's Flycatcher moved onto the territory where the nest was located and interacted aggressively with the male Yellow-bellied Flycatcher. Throughout the morning, for several hours, the male Hammond's Flycatcher chased the male Yellow-bellied Flycatcher around the territory. The male Hammond's sang its full song and frequently repeated the lowest, scratchy syllable of the song ("*tsurrt,*" Sedgwick 1994) over and over, apparently in response to the singing male Yellow-bellied Flycatcher. Chases in the air sometimes extended for 50 m, with both birds alighting in the same tree. The male Hammond's remained on the Yellow-bellied's territory for 2–3 days, aggressively chasing the male Yellow-bellied, but eventually disappeared.

Other Hammond's Flycatchers defended territories on the site, and we thought they nested. Hammond's habitat was similar to that used by Yellow-bellied Flycachers but generally included taller trees, deeper in the ravines. The Alder Flycatcher was also common on the site, breeding (six nests) in flatter, wetter, and shrubbier habitat than the Yellow-bellied Flycatchers. Territories of Yellow-bellied and Alder flycatchers did abut and probably overlapped to a limited extent, but we observed no interactions between these two species.

DISCUSSION

Evidence that Yellow-bellied Flycatchers breed in Alaska has come from several locations in the east-central portions of the state (Benson et al. 2000, Tobish 2004). The location of this population of Yellow-bellied Flycatchers—to the north and west of Fairbanks—was farther west than expected. The size of the population and abundance of habitat at this site suggests that this species may well be more widespread in Alaska, particularly along the Yukon River drainage. However, it is also possible that the Eureka birds constitute an outlying enclave beyond the main nesting range of the species.

Habitat use of this population of Yellow-bellied Flycatchers differed from typical breeding habitats described for this species. The typical breeding habitat is dominated by conifers, with deciduous trees constituting no more than half of the dominant tree species (Gross and Lowther 2001). In contrast, most of the Yellow-bellied Flycatcher territories northwest of Fairbanks included almost no coniferous trees whatsoever. Instead, the territories were composed of dense deciduous thickets of alder, willow, and birch, and open

areas of tundra interspersed with paper birch. A ground cover of thick moss and steep slopes were found in all territories, and birds were observed foraging primarily within 2 m of the ground, within thickets. This departure from coniferous habitat is also characteristic of Hammond's Flycatcher in Alaska, where that species nests "primarily in tall deciduous ... forests, sometimes with spruce interspersed" (Kessel and Gibson 1978:58). In the southern portions of Hammond's range it is associated with tall coniferous forest almost exclusively (Sedgwick 1994).

Despite the Yellow-bellied Flycatcher's broad geographic distribution, its breeding biology is poorly known. Much of what is known about this species has come from early work on nests in Michigan (Walkinshaw and Henry 1957, Walkinshaw 1967) and from intensive work in the mountains of Pennsylvania (Gross and Lowther 2001). The basic information on breeding behavior we describe, including nestling-feeding rates and brooding behavior, is the first such data reported for the species (cf. Gross and Lowther 2001). The nestling period we report is only the second recorded. The previous report of a 13-day nestling period came from Michigan (Walkinshaw and Henry 1957) and might have represented a premature fledging resulting from disturbance. At the Alaska nest, the nestlings were capable of fledging at 9 days but, when undisturbed, remained in the nest another 6 days. Also of note was the pattern of activity of Yellow-bellied Flycatchers at such a high latitude. Late in the nestling period, the birds were active for 21.5 hours of the day, with feeding rates reaching a high of one feeding every 2 minutes. Despite 24 hours of available daylight, however, the female Yellow-bellied Flycatcher reducted her activity from shortly after midnight to 03:00 or 04:00 (Figures 4, 10).

Overall, the breeding population northwest of Fairbanks provided a valuable look into the Yellow-bellied Flycatcher's habitat use and breeding biology near or at the edge of its breeding distribution. Further surveys will be required before this species' breeding range in Alaska is known with certainty.

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UPDATE ON THE BIRDS OF ISLA GUADALUPE, BAJA CALIFORNIA

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ABSTRACT: We report 56 bird specimens of 31 species taken on Isla Guadalupe, Baja California, between 1986 and 2004 and housed at the Colección Ornitológica del Laboratorio de Vertebrados de la Facultad de Ciencias, Universidad Autónoma de Baja California, Ensenada, along with other sight and specimen records. The specimens include the first published Guadalupe records for 10 species: the Ring-necked Duck (*Aythya collaris*), Long-billed Curlew (*Numenius americanus*), Bonaparte's Gull (*Larus philadelphia*), Ash-throated Flycatcher (*Myiarchus cinerascens*), Warbling Vireo (*Vireo gilvus*), Tree Swallow (*Tachycineta bicolor*), Yellow Warbler (*Dendroica petechia*), Magnolia Warbler (*Dendroica magnolia*), Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), and Orchard Oriole (*Icterus spurius*). A specimen of the eastern subspecies of Brown-headed Cowbird (*Molothrus ater ater*) and a sight record of the Gray-cheeked Thrush (*Catharus minimus*) are the first reported from the Baja California Peninsula (and islands). A photographed Franklin's Gull (*Larus pipixcan*) is also an island first. Currently 136 native species and three species introduced in North America have been recorded from the island and nearby waters.

Isla Guadalupe, 260 km west of the coast of Baja California, is the most isolated of the islands off Alta and Baja California and, prior to extensive devastation caused by introduced goats, hosted the most distinctive avifauna of any of those islands. Nevertheless, despite the island's 130-year history of ornithological exploration, its migratory birds remain little studied.

This update focuses on 56 specimens collected on the island between 1986 and 2004 (housed at the Colección Ornitológica del Laboratorio de Vertebrados de la Facultad de Ciencias, Universidad Autónoma de Baja California, Ensenada) and observations by Unitt and Alwin van der Heiden during a visit to the island 4–8 June 2000. Unitt's survey in 2000 focused on searching for the endemic subspecies of the Ruby-crowned Kinglet (*Regulus calendula obscurus*) in the island's cypress groves using taped recordings of the species' song. Other important bird specimens in the UABC collection were reported by Ruiz-Campos and Quintana-Barrios (1991), Ruiz-Campos and Rodríguez-Meraz (1993, 1997), Cota-Campbell and Ruiz-Campos (1995), Ruiz-Campos and Contreras-Balderas (1999), Ruiz-Campos et al. (2001, 2004), Erickson et al. (2002), and Ruiz-Campos (2004).

SPECIES ACCOUNTS

In the following accounts, specimens are listed first by their catalog number, followed by age, sex, date, and location, as available. Except where

noted otherwise, all specimens were collected by Quintana-Barrios during four visits to Isla Guadalupe: 7 March–7 April 1986, 11 August–28 September 1986, 17 November–13 December 1986, and 25 April–24 May 1991. Most of the subspecific identifications are based on comparison of these specimens with the bird collection at the San Diego Natural History Museum (SDNHM).

Ring-necked Duck *Aythya collaris*. UABC 372, immature male, 22 November 1986, airstrip. First Guadalupe record of a species very rare on California's offshore islands (Sullivan and Kershner 2005).

Laysan Albatross *Phoebastria immutabilis*. UABC 1335, 1336, and 1337, skulls, 28 or 29 January 2003, William Henry. UABC 1338, 1339, and 1340, eggs, 28 or 29 January 2003, William Henry. UABC 1404, chick ~37 days old, 9 February 2003, Daniel Barton. To our knowledge, these are the only Guadalupe specimens. Jehl and Everett (1985) listed only three records from the vicinity of Guadalupe, but since 1986 the species has nested there in increasing numbers (Dunlap 1988, Gallo-Reynoso and Figueroa-Carranza 1996, Pitman et al. 2004). With 30 chicks and two adults on Islote Zapato in June 2000, and 22 chicks and one adult on Islote Negro at the same time (Pitman et al. 2004), there is now concern that nesting albatrosses on Guadalupe's offshore islets, never ravaged by goats, may jeopardize the endemic flora (J. P. Rebman pers. comm.).

Northern Fulmar *Fulmaris glacialis*. UABC 349, immature male, 30 November 1986, Punta Norte. This species is undoubtedly an irregular winter visitor to the waters around Isla Guadalupe, but Jehl and Everett (1985) and Howell and Webb (1992) reported the only other specific records: 6–7 December 1973 and 27 January 1988.

Leach's Storm-Petrel *Oceanodroma leucorhoa*. UABC 1332, adult, wing chord 137 mm, March 2003, Punta Sur, William Henry. UABC 1333, fresh juvenile, wing chord 143 mm, March 2003, Punta Sur, William Henry. Jehl and Everett (1985) summarized the confusing situation concerning the extinct Guadalupe Storm-Petrel (*O. macrodactyla*) and the winter and summer breeding populations of Leach's Storm-Petrels on Guadalupe. These specimens presumably represent the winter-breeding population.

Cattle Egret *Bubulcus ibis*. UABC 345, immature male, 22 November 1986, airstrip. The first island record. Howell and Webb (1992) subsequently saw seven between Tepeyac and the airstrip on 27 January 1988. This species colonized portions of California and the Baja California Peninsula between the 1960s and 1980s but has since become less frequent as a far-flung vagrant.

American Kestrel *Falco sparverius*. UABC 346, immature female, 18 August 1986, airstrip. UABC 383, immature male, 18 August 1986, airstrip. UABC 365, adult male, 2 December 1986, airstrip. The resident population appears to have been seen by all recent visitors to the island, although occasionally in low numbers, as by Oberbauer et al. (1989), Howell and Webb (1992), and Unitt in 2000. Unitt found this species to be scarce in the cypress groves in 2000, suggesting that the kestrels of Isla Guadalupe may nest primarily or exclusively in rock crevices, as is the case on San Clemente Island (Sullivan et al. 2003).

The supposed endemic subspecies *F. s. guadalupensis* Bond, 1943, is evidently not adequately differentiated from nominate *sparverius*. The describer noted that its size is equal to that of *sparverius* from British Columbia, even if larger than that of kestrels from the mainland nearest Isla Guadalupe. The degree of overlap in collar color evident from Bond's (1943) table 5 exceeds that allowing 75% of Guadalupe birds to be distinguished from mainland specimens. Friedmann et al. (1950) and Bird and Palmer (1988) also synonymized *guadalupensis* with *sparverius*.

Long-billed Curlew *Numenius americanus*. UABC 347, immature male, 28 September 1986, airstrip. Only Guadalupe record of this species rare on the islands off California.

Franklin's Gull *Larus pipixcan*. Mark J. Billings photographed Guadalupe's first recorded Franklin's Gull, an adult off the southeast end of the island, 14–17 November 2001. As of summer 2005, more than 30 other Franklin's Gulls had been reported from the Baja California Peninsula (Wilbur 1987, Erickson and Howell 2001, *N. Am. Birds*), including one at Islas Los Coronados 21 May 1967 (Jehl 1977).

Bonaparte's Gull *Larus philadelphia*. Lewis W. Walker collected Guadalupe's only known Bonaparte's Gull, an immature female, on 12 November 1938 (SDNHM 17969). Huey (1954) failed to report this specimen, even though he reported Walker's Common Yellowthroat (*Geothlypis trichas occidentalis*) collected the same day.

Xantus's Murrelet *Synthliboramphus hypoleucus*. UABC 604, second year, 19 March 1993, La Capilla, Javier Guillén. Jehl and Everett (1985) summarized the status of the breeding population of *S. h. hypoleucus* on Isla Guadalupe. Not previously reported is a specimen of subspecies *S. h. scrippsi*, which flew aboard a ship "south of Isla Guadalupe" at night on 11 February 1964 (SDNHM 35256).

Mourning Dove *Zenaida macroura*. UABC 358, adult, 22 September 1986, airstrip. UABC 1514, immature male, 20 January 2004, zone 2 north, Marlenne Rodríguez. In June 2000 Unitt found one nest with eggs and another with chicks. The Mourning Dove established itself on Isla Guadalupe in the 1960s and is now a common breeding resident (Jehl and Everett 1985, Barton et al. 2004), although we are unaware of any other specimen records.

Burrowing Owl *Athene cunicularia*. UABC 350, immature, 18 September 1986, airstrip, Palacios et al. (2000). In contrast to its plight on much of the mainland, on Isla Guadalupe the Burrowing Owl remains a fairly common resident, feeding in part on storm-petrels and murrelets (Barton et al. 2004).

Anna's Hummingbird *Calypte anna*. UABC 476, female, 24 May 1991, airstrip. In June 2000 Unitt saw up to seven per day in the cypress groves. The species is a widespread resident on Isla Guadalupe.

Northern Flicker *Colaptes auratus*. UABC 359, immature female, 4 December 1986, cypress grove. In June 2000 Unitt saw up to five per day in the cypress groves. Sweet et al. (2001) documented the extinction of the resident endemic Guadalupe Flicker (*C. a. rufipileus*) during the early 1900s and subsequent recolonization of the island by *C. a. collaris* from the mainland.

Say's Phoebe *Sayornis saya*. UABC 353, adult male, 13 December 1986, Punta Norte. The only other reports from the island are of eight seen November–December 1973 (Jehl and Everett 1985), one seen 22–25 January 1988 (Howell and Webb 1992), and another seen 28 February 2003 (Barton et al. 2004). All have been found on the north end of the island. The specimen is of the dark northern subspecies, *S. s. saya*, which has been recorded during migration and winter on Islas Los Coronados, Islas Todos Santos, Isla Cedros, and south to the tip of the Baja California Peninsula (Grinnell 1928).

Ash-throated Flycatcher *Myiarchus cinerascens*. UABC 388, immature, 3 September 1986, airstrip. Only island record of this fairly common western North American migrant.

Warbling Vireo *Vireo gilvus*. UABC 375, immature, 20 August 1986, airstrip. UABC 377, immature, 20 August 1986, airstrip. Only island records of this common western North American migrant. The specimens presumably represent the western *V. g. swainsonii*, but our examination was inconclusive.

Tree Swallow *Tachycineta bicolor*. UABC 374, immature (male?), 17 November 1986, Tepeyac. Only island record of this common western North American migrant.

Rock Wren *Salpinctes obsoletus*. UABC 0356, adult, 5 December 1986, airstrip. UABC 0478, first year, 29 April 1991, airstrip. UABC 0479, 29 April 1991, airstrip. The Guadalupe Rock Wren (*S. o. guadeloupensis*) is one of the island's most common resident landbirds. The larger size and longer and heavier bill of the endemic subspecies, in comparison with nominate *obsoletus* of the mainland, are obvious in the field. The song of the island subspecies resembles that of the mainland form but is slightly lower pitched. The second element of the "sp-chee!" call is notably lower pitched and briefer, with fewer vibrations per second.

Gray-cheeked Thrush *Catharus minimus*. During Unitt's and van der Heiden's search of the cypress groves in June 2000, they encountered only a single migrant from the mainland, a Gray-cheeked Thrush in the south cypress grove on 6 June. The date approximates those of two spring vagrants in California, both on Southeast Farallon Island (California Bird Records Committee unpubl. data). There are no previous records from western Mexico of this species, which breeds in the boreal forests of Canada, Alaska, and northeastern Siberia and migrates to Amazonia (A.O.U. 1998). Unfortunately, van der Heiden was not able to approach it closely enough for identifiable photographs.

We found the thrush foraging on fallen cypress trees near the center of the densest remaining stand. Its size and posture were like those of other *Catharus* thrushes, and it usually held its tail elevated at about a 30° angle. Its upperparts were olive gray-brown, more olive than in any form of *Catharus* occurring regularly in southern or Baja California. The crown and back were uniform, the wings and tail appearing only very slightly browner. The indistinct eye ring was grayish white. The sides of the head faded gradually from the olive gray of the crown; that is, they lacked any tinge of buff. The unspotted throat was slightly buffy, the only area of buffy or rufous color on the bird. The whitish breast was softly spotted with olive gray. The spotting continued diffusely onto the flanks, which were lightly tinged gray (not buff). The belly and undertail coverts were white. Eye dark, legs dull pinkish (pale).

Northern Mockingbird *Mimus polyglottos*. UABC 348, immature, 30 November 1986, airstrip. Jehl and Everett (1985) listed only three records for the island, but most subsequent visitors have recorded one or two. Unitt noted a single individual singing territorially from a tree at the edge of the southern cypress grove on the mornings of 5 and 6 June 2000.

European Starling *Sturnus vulgaris*. UABC 389, immature, 11 August 1986, airstrip. UABC 351, immature male, 30 November 1986, airstrip. Starlings were first reported on Guadalupe in May 1971 (Jehl and Everett 1985), 130 were seen in January 1988 (Howell and Webb 1992), and the species was common and nesting by May/June 1996 (juvenile collected, Sweet et al. 2001). In 2000, however, Unitt observed only one adult in the north cypress grove on 5 June and four juveniles near the spring on 7 June.

Cedar Waxwing *Bombycilla cedrorum*. UABC 460, second-year female, 25 April 1991, airstrip. UABC 477, second-year female, 29 April 1991, airstrip. The only other island record of this widespread North American species is of one collected 28 January 1886 (Bryant 1887).

Yellow Warbler *Dendroica petechia*. UABC 360, immature female, 21 August 1986, airstrip. The only island record. The specimen is *D. p. morcomi*, the widespread breeder in most of the western United States and a common migrant in western North America.

Magnolia Warbler *Dendroica magnolia*. UABC 361, adult female, 20 August 1986, airstrip. This specimen, which represents the only island record of this vagrant, predates all other records for the Baja California Peninsula summarized by Erickson et al. (2001). Ruiz-Campos et al. (2001) reported the only other specimen from the peninsula, taken at Isla Cedros 19 September 1986.

Wilson's Warbler *Wilsonia pusilla*. UABC 472, second-year male, 8 May 1991, airstrip. UABC 473, adult male, 8 May 1991, airstrip. Jehl and Everett (1985) reported only two other island records of this common western North American migrant (18 May 1971, 18 April 1979), but Grinnell (1928) reported a specimen of *W. p. pileolata* "taken at sea, north of Guadalupe Island" on 25 April 1911. The more recent Guadalupe specimens also represent *pileolata*, which breeds from the Great Basin/Rocky Mountain region north to Alaska and which is a regular spring migrant and irregular fall migrant along the coast of southern California (e.g., Unitt 2004), though less numerous than the brighter yellow subspecies breeding along the Pacific coast, *W. p. chryseola*.

Chipping Sparrow *Spizella passerina*. UABC 357, immature, 21 August 1986, airstrip. The only other island records are of one on 6 January 1886 (specimen), several in November–December 1973 (both Jehl and Everett 1985), and one found dead on 1 February 2003 (Barton et al. 2004). Given nesting records from San Clemente Island (Sullivan and Kershner 2005), Islas Los Coronados (Jehl 1977), and on the adjacent mainland to south of Ensenada (*N. Am. Birds* 57:549), the species could colonize the island in the future. The specimen is *S. p. arizonae*, the subspecies widespread in western North America.

White-crowned Sparrow *Zonotrichia leucophrys*. UABC 355, immature male, 20 November 1986, airstrip. This abundant western North American migrant remains poorly represented on Guadalupe, with two seen on 14 April 1970 (Jehl and Everett 1985), eight from 22 to 25 January 1988 (Howell and Webb 1992), one on 23 November 1989 (Mellink and Palacios 1990), and seven during the period 28 January–8 April 2003 (Barton et al. 2004) being the only others reported. The specimen, and presumably most or all of the sight records, represent subspecies *Z. l. gambelii*.

Dark-eyed Junco *Junco hyemalis*. UABC 381, adult, 23 August 1986, cypress grove. UABC 373, adult, 8 September 1986, cypress grove. UABC 379, 380, and 1080, immatures, 8 December 1986, cypress grove. All specimens are of the endemic Guadalupe Junco (*J. h. insularis*). Until 1973 the A.O.U. (1973) considered this long-billed, sexually monomorphic junco to be specifically distinct, and it is still widely treated that way. Howell and Webb's (1995) population estimate of 50–100 individuals appears to be low. In 1996 Sweet et al. (2001) considered the species "common within the cypress grove." In June 2000, Unitt had daily counts as high as 90 (including many juveniles) and estimated the population to be on the order of 1000. Barton et al. (2004) estimated the population size to be >500. The species is listed as endangered by the Mexican government (SEMARNAT 2002) and as critical by Birdlife International (2000). Howell (1968) wrote the most thorough account of the species, but Nolan et al. (2002) stated that "only the most rudimentary facts are known" and "any detailed information about any aspect of its life history would be a contribution." Unitt observed the birds feeding heavily on both the seeds of exotic grasses and on insects, sometimes flycatching from the ground. The song and calls of the Guadalupe Junco differ fundamentally from those of juncos on the nearby mainland. The song is a variable but complex warbling recalling the song of a Sage (*Amphispiza belli*) or Lark (*Chondestes grammacus*) Sparrow, not a simple trill as heard from juncos in southern California. Mirsky (1976) published some sonograms. The call is a metallic note resembling the call of a California Towhee (*Pipilo crissalis*), not the toneless chip heard from juncos in southern California.

Western Meadowlark *Sturnella neglecta*. UABC 384, male, 26 September 1986, airstrip. First island specimen; the species was subsequently collected by Sweet et al. (2001). Jehl and Everett (1985) listed only one 1886 record, but meadowlarks apparently colonized in the late 1980s (Howell and Webb 1992, Barton et al. 2004). Subspecific identification of the specimen was not possible.

Yellow-headed Blackbird *Xanthocephalus xanthocephalus*. UABC 366, immature male, 12 September 1986, airstrip. Only island record of this species, which is generally rare as a migrant on the Baja California Peninsula.

Brown-headed Cowbird *Molothrus ater*. UABC 390, adult female *M. a. artemisiae*, 4 September 1986, airstrip. UABC 352, immature male *M. a. ater*, 18 November 1986, airstrip. UABC 385, female *M. a. obscurus*, 5 December 1986, airstrip. These specimens predate the island's only other published records: 13 seen on 27 January 1988 (Howell and Webb 1992) and 15 seen on 23 November 1989 (Mellink and Palacios 1990). Remarkably, the three specimens represent all three subspecies (Figure 1). The Dwarf Cowbird (*M. a. obscurus*) is the prevalent subspecies on the adjacent mainland. The larger Nevada Cowbird (*M. a. artemisiae*) is rare or uncommon on the Pacific slope of California and northern Baja California, with one collected on Islas Los Coronados 5 September 1914 (Unitt 2004) representing the only other published specimen record for the Baja California Peninsula north of the Cape District (Grinnell 1928, A.O.U. 1957). The Eastern Cowbird (*M. a. ater*) is a vagrant in the West, with only two specimen records for California (San Diego County 1 March 1978, Unitt 2004; Imperial County 15 January 1989, Patten et al. 2003) and no previous records for the Baja California Peninsula.

Orchard Oriole *Icterus spurius*. UABC 461, second-year female, 24 May 1991, airstrip. First island record of this vagrant from eastern North America. Wilbur (1987)

Figure 1. Three specimens of the Brown-headed Cowbird from Isla Guadalupe, representing three subspecies: *ater, obscurus,* and *artemisiae*. Note the more bulbous maxilla of the male (left), the key feature identifying it as the eastern subspecies, *Molothrus a. ater*.

Photo by Gorgonio Ruiz-Campos

and Wurster et al. (2001) summarized previous records for the Baja California Peninsula, including the only other specimen: a mummified carcass found at Isla San Benito Oeste in April 1963 (SDNHM 30629). Fourteen more individuals through winter 2005 were reported in the seasonal summaries published in *N. Am. Birds*. Off California, 51 had been recorded in fall and two in spring though 1999 at Southeast Farallon Island (Richardson et al. 2003), but only five have been found on the Channel Islands, all in fall (Sullivan and Kershner 2005).

House Finch *Carpodacus mexicanus*. UABC 364, male, 1 December 1986, airstrip. UABC 378, immature male, 1 December 1986, airstrip. UABC 382, adult female, 1 December 1986, airstrip. UABC 387, adult male, 1 December 1986, airstrip. All specimens are of the endemic Guadalupe House Finch (*C. m. amplus*), considered specifically distinct until 1973 (A.O.U. 1973). The species remains common (Barton et al. 2004). In 2000 Unitt estimated up to 200 on 7 June (including about 150 around the spring) and saw many recent fledglings still accompanying their parents. The larger size and larger, more parrotlike bill of *amplus*, in comparison to *frontalis* of the nearby mainland, are conspicuous in the field. The song of the Guadalupe subspecies resembles that of *frontalis* but lacks the ascending, burry "zweep!" at the end. It seems to be less varied in pitch than the song of *frontalis*, so that it sometimes sounds halfway between the song of a mainland House Finch and that of a California Purple Finch (*C. purpureus californicus*).

DISCUSSION

The urgent tasks of conservation on Isla Guadalupe are finally underway with removal of goats from the island beginning in 2003 by the Grupo de Ecología y Conservación de Islas, the Mexican Secretary of Natural Resources, the Mexican Navy, and the island's fishing cooperative (Aguirre Muñoz et al. 2004). By summer 2005 nearly all the goats had been removed and vigorous recovery of the island's vegetation had begun (E. Ezcurra pers. comm.).

Howell and Cade (1954, 1956) listed 59 species of birds for Isla Guadalupe. Expanded coverage to include offshore waters to approximately 15 km, new records, and reanalysis of previous records led Jehl and Everett (1985) to recognize 112 species. Howell and Webb (1995, appendix C) considered three species hypothetical and updated the list to 117. Since then, Pyle et al. (1994), Unitt (in Howell et al. 2001), Sweet et al. (2001), Barton et al. (2004), and Erickson et al. (2005) added nine species (detailed in Appendix 1). From our own evaluation, we now recognize 139 species for the island and vicinity (Appendix 1), three of which were introduced into North America. Recognition of the Guadalupe Junco as a distinct species would add one, as Jehl and Everett (1985) and Barton et al. (2004) reported Oregon Juncos (*J. h. oreganus* subspecies group) as well. In addition to the endemic Guadalupe Storm-Petrel (*Oceanodroma macrodactyla*) and Guadalupe Caracara (*Caracara lutosa*), populations of eight other former breeders on the island are now considered extinct: Red-tailed Hawk (*Buteo jamaicensis*), White-throated Swift (*Aeronautes saxatalis*), Guadalupe Flicker (*Colaptes auratus rufipileus*), Red-breasted Nuthatch (*Sitta canadensis*), Guadalupe Bewick's Wren (*Thryomanes bewickii brevicauda*), Guadalupe Ruby-crowned Kinglet (*Regulus calendula obscurus*), Guadalupe Spotted Towhee (*Pipilo maculatus consobrinus*), and Red Crossbill (*Loxia curvirostra*).

The Guadalupe Ruby-crowned Kinglet was last reported during the breeding season in June 1953, when Howell and Cade (1954) reported five singing males in the cypress grove. Most subsequent bird surveys on the island took place when migrants from the mainland are possible (October–April) or did not target the kinglet specifically. The negative result of our intensive search for the Ruby-crowned Kinglet in June 2000 confirms, to our satisfaction, the extinction of this well-marked subspecies (body plumage tinged dark brownish; crown patch pink, not red). Even if this subspecies' vocalizations differed considerably from those of mainland birds, we heard no songs or calls that could represent this species.

Islands are famous for the long lists of migratory bird species they are able to produce. Consider the 403 species recorded at tiny Southeast Farallon off San Francisco (Richardson et al. 2003). Two of the new species for Guadalupe we report are migrants as common as the Warbling Vireo and Yellow Warbler, showing that the pool of potential additions to the island's list has only begun to be tapped. Jehl and Everett's (1985) tables 1–3 show the seasonal distribution of ornithological investigations on the island 1875–1982. Only four visits were in September/October, the two most productive months for variety of migrant landbirds at this latitude. With enough time and coverage the Isla Guadalupe species list is likely to more than double in length.

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Appendix 1. Birds recorded from Isla Guadalupe and vicinity. Each species is followed by numbers corresponding to publications (listed below) concerning that species' status on the island. Virtually all publications prior to 1954 were summarized by Howell and Cade (1954) in the first full listing of the island's avifauna, and we use that publication as our starting point. Jehl and Everett (1985) wrote a detailed account of all species, and Howell and Webb (1995) produced the only subsequent complete list. Species for which a collected specimen has been reported are designated with an asterisk. Specimens collected by W. E. Bryant in 1885, however, were destroyed in the San Francisco earthquake and fire of 1906 and are designated with a dagger. Subspecies are listed only when confirmed with specimens.

1. Howell and Cade 1954; 2. Howell and Cade 1956; 3. Small 1961; 4. Howell 1968; 5. Jehl and Everett 1985; 6. Dunlap 1988; 7. Oberbauer et al. 1989; 8. Mellink and Palacios 1990; 9. Howell and Webb 1992; 10. Pyle et al. 1994; 11. Howell and Webb 1995; 12. Gallo-Reynoso and Figueroa-Carranza 1996; 13. Palacios et al. 2000; 14. Howell et al. 2001; 15. Sweet et al. 2001; 16. Pitman and Ballance 2002; 17. Barton et al. 2004; 18. Erickson et al. 2005; 19. Pitman et al. 2004; 20, this report.

Greater White-fronted Goose *Anser albifrons*	1, 5, 17
Brant *Branta bernicla*	5
*Mallard *Anas platyrhynchos*	5
*Blue-winged Teal *Anas discors*	5
Cinnamon Teal *Anas cyanoptera*	5
Northern Shoveler *Anas clypeata*	9
Northern Pintail *Anas acuta*	5
*Ring-necked Duck *Aythya collaris*	20
Lesser Scaup *Aythya affinis*	5, 11
Red-breasted Merganser *Mergus serrator*	5
*Pacific Loon *Gavia pacifica*	1, 5
*Pied-billed Grebe *Podilymbus podiceps*	5
*Eared Grebe *Podiceps nigricollis*	2, 5
Western Grebe *Aechmophorus occidentalis*	5, 11
*Laysan Albatross *Phoebastria immutabilis*: **breeds**	3, 5, 6, 7, 8, 9, 10, 12, 15, 19, 20
*Black-footed Albatross *Phoebastria nigripes*: **breeds**	3, 5, 16
Short-tailed Albatross *Phoebastria albatrus*	5
*Northern Fulmar *Fulmarus glacialis*	5, 9, 20
Cook's Petrel *Pterodroma cookii*	3, 5
*Sooty Shearwater *Puffinus griseus*	5
*Black-vented Shearwater *Puffinus opisthomelas*: **breeds**	1, 5
*Leach's Storm-Petrel *Oceanodroma leucorhoa socorroensis*: **breeds**	1, 5, 8, 20
*Wedge-rumped Storm-Petrel *Oceanodroma tethys*	1, 5
*Guadalupe Storm-Petrel *Oceanodroma macrodactyla*: **extinct**	1, 5
Red-billed Tropicbird *Phaethon aethereus*	5
*Red-tailed Tropicbird *Phaethon rubricauda*	1, 5
Masked Booby *Sula dactylatra*	10
Brown Pelican *Pelecanus occidentalis*	1, 5
*Brandt's Cormorant *Phalacrocorax penicillatus*: **breeds**	1, 5, 15
Pelagic Cormorant *Phalacrocorax pelagicus*	5, 10, 11
Magnificent Frigatebird *Fregata magnificens*	5
Great Blue Heron *Ardea herodias*	1, 5, 17
*Cattle Egret *Bubulcus ibis*	9, 20
*Osprey *Pandion haliaetus carolinensis*: **bred formerly?**	1, 5
*Red-tailed Hawk *Buteo jamaicensis calurus*: **extirpated**	1, 5
*Guadalupe Caracara *Caracara lutosa*: **extinct**	1, 5
*American Kestrel *Falco sparverius sparverius*: **breeds**	1, 5, 7, 8, 9, 15, 17, 20
Peregrine Falcon *Falco peregrinus*	5, 17
Pacific Golden-Plover *Pluvialis fulva*	5, 9, 17
Killdeer *Charadrius vociferus*	5, 8
Willet *Catoptrophorus semipalmatus*	5
*Wandering Tattler *Heterosceles incanus*	1, 5, 17
Spotted Sandpiper *Actitis macularius*	17
*Long-billed Curlew *Numenius americanus*	20
*Ruddy Turnstone *Arenaria interpres*	5, 17
*Black Turnstone *Arenaria melanocephala*	1, 5, 17
Sanderling *Calidris alba*	5
Western Sandpiper *Calidris mauri*	5
*Short-billed Dowitcher *Limnodromus griseus*	5
Wilson's Snipe *Gallinago delicata*	1
*Red Phalarope *Phalaropus fulicarius*	3, 5
Pomarine Jaeger *Stercorarius pomarinus*	5
Parasitic Jaeger *Stercorarius parasiticus*	11
Long-tailed Jaeger *Stercorarius longicaudus*	5

Laughing Gull *Larus atricilla* 9, 10
Franklin's Gull *Larus pipixcan* 20
*Bonaparte's Gull *Larus philadelphia* 20
Heermann's Gull *Larus heermanni* 5, 9
Ring-billed Gull *Larus delawarensis* 5, 8, 9, 17
*California Gull *Larus californicus californicus* 5, 9, 17
*Herring Gull *Larus argentatus smithsonianus* 1, 5, 17
Thayer's Gull *Larus thayeri* 5
*Western Gull *Larus occidentalis wymani*: **breeds** 1, 5, 8, 15, 17
Glaucous-winged Gull *Larus glaucescens* 1, 5, 17
Black-legged Kittiwake *Rissa tridactyla* 5
Sabine's Gull *Xema sabini* 5
Royal Tern *Sterna maxima* 5, 11
Arctic Tern *Sterna paradisaea* 5
Xantus's Murrelet *Synthliboramphus hypoleucus*
  S. h. hypoleucus*: **breeds 1, 5, 7, 20
  **S. h. scrippsi* 20
*Cassin's Auklet *Ptychoramphus aleuticus*: **breeds** 1, 5
*Rhinoceros Auklet *Cerorhinca monocerata* 1, 5
Rock (Feral) Pigeon *Columba livia*: **possibly breeds** 5, 9, 17
*White-winged Dove *Zenaida asiatica* 1, 8
*Mourning Dove *Zenaida macroura*: **breeds** 1, 5, 7, 8, 9, 15, 17, 20
*Barn Owl *Tyto alba* 15
*Burrowing Owl *Athene cunicularia*: **breeds** 1, 5, 7, 9, 13, 15, 17, 20
Vaux's Swift *Chaetura vauxi* 5, 11
*White-throated Swift *Aeronautes saxatalis:* **extirpated** 1
*Anna's Hummingbird *Calypte anna*: **breeds** 1, 5, 7, 9, 15, 17, 20
Belted Kingfisher *Ceryle alcyon* 5, 17
Northern Flicker *Colaptes auratus*
  C. a. collaris*: **breeds 5, 7, 9, 15, 17, 20
  C. a. rufipileus*: **extinct 1, 5
*Least Flycatcher *Empidonax minimus* 5
*Say's Phoebe *Sayornis saya saya* 5, 9, 17, 20
*Ash-throated Flycatcher *Myiarchus cinerascens* 20
†Loggerhead Shrike *Lanius ludovicianus* 1, 5
*Warbling Vireo *Vireo gilvus* 20
Clark's Nutcracker *Nucifraga columbiana* 5
*Tree Swallow *Tachycineta bicolor* 20
Northern Rough-winged Swallow *Stelgidopteryx serripennis* 5
Barn Swallow *Hirundo rustica* 5
*Red-breasted Nuthatch *Sitta canadensis*: **extirpated** 1, 5
*Rock Wren *Salpinctes obsoletus*
  guadaloupensis: **breeds** 1, 5, 7, 8, 9, 15, 17, 20
*Bewick's Wren *Thryomanes bewickii brevicauda*: **extinct** 1, 5
Ruby-crowned Kinglet *Regulus calendula*
  (**R. c. obscurus*: **extinct**) 1, 5, 9, 17, 20
†Mountain Bluebird *Sialia currucoides* 1, 5, 17
Townsend's Solitaire *Myadestes townsendi* 5
Gray-cheeked Thrush *Catharus minimus* 14, 20
*Swainson's Thrush *Catharus ustulatus ustulatus* 15
†Hermit Thrush *Catharus guttatus* 1, 5, 9
†American Robin *Turdus migratorius* 1, 5, 17
†Varied Thrush *Ixoreus naevius* 1, 5, 8
Gray Catbird *Dumetella carolinensis* 18
*Northern Mockingbird *Mimus polyglottos*:
  possibly breeds 1, 5, 8, 9, 15, 17, 20

†Sage Thrasher *Oreoscoptes montanus*	1, 5, 17
*European Starling *Sturnus vulgaris*: **breeds**	5, 7, 8, 9, 15, 17, 20
†American Pipit *Anthus rubescens*	1, 5
*Cedar Waxwing *Bombycilla cedrorum*	1, 5, 20
Phainopepla *Phainopepla nitens*	8
*Yellow Warbler *Dendroica petechia morcomi*	20
*Magnolia Warbler *Dendroica magnolia*	20
Yellow-rumped Warbler *Dendroica coronata*	
†Audubon's Warbler *D. c. auduboni* group of subspecies	1, 5, 9, 17
Myrtle Warbler *D. c. coronata* group of subspecies	5, 17
Townsend's Warbler *Dendroica townsendi*	5
Palm Warbler *Dendroica palmarum*	17
Black-and-white Warbler *Mniotilta varia*	5
*Ovenbird *Seiurus aurocapilla aurocapilla*	1, 5
*Common Yellowthroat *Geothlypis trichas occidentalis*	1, 5
*Wilson's Warbler *Wilsonia pusilla pileolata*	5, 20
*Summer Tanager *Piranga rubra rubra*	1, 5
*Spotted Towhee *Pipilo maculatus consobrinus*: **extinct**	1, 5
*Chipping Sparrow *Spizella passerina arizonae*	1, 5, 17, 20
Vesper Sparrow *Pooecetes gramineus*	9
†Fox Sparrow *Passerella iliaca unalaschcensis* group of subspecies	1, 5
*Lincoln's Sparrow *Melospiza lincolnii lincolnii*	1, 5
*White-throated Sparrow *Zonotrichia albicollis*	1, 5
*White-crowned Sparrow *Zonotrichia leucophrys gambelii*	5, 8, 9, 17, 20
†Golden-crowned Sparrow *Zonotrichia atricapilla*	1, 5
Dark-eyed Junco *Junco hyemalis*	
*Guadalupe Junco *J. h. insularis*: **breeds**	1, 4, 5, 7, 8, 9, 15, 17, 20
†Oregon Junco *J. h. oreganus* group of subspecies	5, 17
*Rose-breasted Grosbeak *Pheucticus ludovicianus*	5
*Black-headed Grosbeak *Pheucticus melanocephalus*	5
*Western Meadowlark *Sturnella neglecta*: **breeds**	1, 5, 8, 9, 10, 15, 17, 20
*Yellow-headed Blackbird *Xanthocephalus xanthocephalus*	20
Brewer's Blackbird *Euphagus cyanocephalus*	5, 9
Brown-headed Cowbird *Molothrus ater*	8, 9
**M. a. obscurus*	20
**M. a. artemisiae*	20
**M. a. ater*	20
*Orchard Oriole *Icterus spurius*	20
*Hooded Oriole *Icterus cucullatus*	10, 15
Scott's Oriole *Icterus parisorum*	5, 11
*House Finch *Carpodacus mexicanus amplus*: **breeds**	1, 5, 7, 8, 9, 10, 15, 17, 20
*Red Crossbill *Loxia curvirostra bendirei*: **extirpated**	1, 5
House Sparrow *Passer domesticus*: **possibly breeds**	9, 10, 17

Unconfirmed species:

Pink-footed Shearwater *Puffinus creatopus*	5, 11
Ashy Storm-Petrel *Oceanodroma homochroa*	1, 5
Black Storm-Petrel *Oceanodroma melania*	5, 11
Double-crested Cormorant *Phalacrocorax auritus*	1, 5, 11
Prairie Falcon *Falco mexicanus*	1, 5
Great Horned Owl *Bubo virginianus*	5, 11

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DISPERSAL AND VAGRANCY IN THE PYRRHULOXIA

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ABSTRACT: The Pyrrhuloxia (*Cardinalis sinuatus*) frequently is considered sedentary. A compilation of extralimital records, however, shows that the species wanders regularly in late fall and winter (chiefly November through March) north and east of its United States range and wanders casually in the spring and summer (May through July) west of this range. There are even six records well outside the species' normal range. The differing geographic and temporal distributions of extralimital records coincide with two subspecies (nominate *C. s. sinuatus* in the east and *C. s. fulvescens* in the west), hinting at the possibility of underlying differences in breeding biology and dispersal timing between the subspecies.

The Pyrrhuloxia (*Cardinalis sinuatus*) is a bird of the arid southwestern United States and northern Mexico. Its range extends into the arid subtropics on either side of the Sierra Madre Occidental, south to Nayarit on the coastal slope and the central Mexican Plateau inland. It consists of three subspecies. Nominate *C. s. sinuatus* Bonaparte,1838, occurs east from southeastern Cochise County, Arizona (Phillips et al. 1964)—that is, it is the taxon east of the Sierra Madre Occidental. *C. s. beckhami* (Ridgway, 1887), with a type from El Paso, Texas, is widely treated as a junior synonym of the nominate subspecies. West of the Sierra Madre Occidental is *C. s. fulvescens* (van Rossem, 1934), characterized by its larger size and brownish gray, not slaty, back (Phillips et al. 1964). There is also a disjunct subspecies in Baja California Sur, the darker and duskier *C. s. peninsulae* (Ridgway, 1887).

In the United States the Pyrrhuloxia occurs in thorn forest and thorn scrub in southeastern Arizona, southern New Mexico, and western and southern Texas. This species is tied closely to mesquite (*Prosopis* spp.) or similar thorny trees (Maurer 1985, Tweit and Thompson 1999). For example, in their study of the avifaunal community of the Chihuahuan Desert, Pidgeon et al. (2001) reported that "of the many open-cup nesters present, only the Pyrrhuloxia had highest abundance in mesquite exclusively." Throughout the 20th century the Pyrrhuloxia followed the northward spread of mesquite—a result of overgrazing—through the grasslands of the northern Chihuahuan Desert and the southern shortgrass prairie (Oberholser 1974, Lloyd et al. 1998, Pidgeon et al. 2001). As a result, many of the extralimital records from the first half of the 20th century (e.g., Phillips et al. 1964) lie within the species' current range.

EXTRALIMITAL OCCURRENCES

Yet the Pyrrhuloxia continues to occur well outside of even this newly established range. The species is largely sedentary—banded individuals have been found in the same area in both summer and winter (Gould 1961). As a result, vagrancy has been limited geographically, with few extralimital

records north of northern Texas, western Oklahoma, southwestern Kansas, southeastern Colorado, northeastern New Mexico, western and northern Arizona, and southern California (A.O.U. 1998). Records from southern Nevada have been questioned (e.g., A.O.U. 1998, Tweit and Thompson 1999), but the recently established Nevada Bird Records Committee has placed the species on the state list (Elphick 2001) on the basis of two records, one supported by a photograph (see Stotz 1980).

There are only six records from substantially farther afield: a male photographed on San Miguel Island, California, 19–23 July 1990 (Heindel and Garrett 1995); one in Linn County in east-central Kansas, 1–22 April 1995 (Table 1, Figure 1); a male photographed near Grant, Park County, Colorado, early July–20 September 1996 (Figure 1; Janos 1998, Truan and Percival 1997); a male photographed at Durango, La Plata County,

Table 1 Extralimital Records of the Pyrrhuloxia, Ordered by Time of Year, from the Southern Great Plains[a]

Date(s)	Location	Source
1 Jan–28 Feb 1993	Kansas; Morton Co.; Elkhart	Kansas B.R.C., AB 47:273
9–16 Jan 1994	Kansas; Hamilton Co.; near Syracuse	Kansas B.R.C.
2 Feb 1995	Kansas; Sedgwick Co.; Wichita	Kansas B.R.C.
21 Mar 1999	Oklahoma; Oklahoma Co.; Oklahoma City	Oklahoma B.R.C.
10 Apr 1999	Texas; Hutchinson Co.	*N. Am. Birds* 53:302
1–22 Apr 1995	Kansas; Linn Co.; Marais des Cygnes W.A.	Kansas B.R.C.
25 Apr 2000	Kansas; Ford Co.; near Dodge City	Kansas B.R.C.
19 May 2000	Kansas; Stafford Co.; Quivira N.W.R.	Kansas B.R.C.
8 Jun 1975	Texas; Wilbarger Co.	Pulich (1988)
4 Jul 1998	Oklahoma; Beaver Co.; Beaver W.M.A.	Oklahoma B.R.C.
12 Oct 1999	Texas; Tarrant Co.	*N. Am. Birds* 53:77
6 Nov–early Dec 1989	Kansas; Morton Co.; near Elkhart	Thompson and Ely (1992)
12 Dec 2001–21 Feb 2002	Oklahoma; Comanche Co.; Wichita Mts.	Oklahoma B.R.C.
12 Dec 2005–early Feb 2006	Oklahoma; Jackson Co.[b]	Oklahoma B.R.C.
mid-Dec 1972–12 Apr 1973	Texas; Denton Co.; Denton	Pulich (1988)
17–20 Dec 1989	Colorado; Prowers Co.; near Holly	Andrews and Righter (1992)
26 Dec 1992–18 Apr 1993	Texas; Tarrant Co.; Ft. Worth	*Am. Birds* 47:277, 47:433
28 Dec 1975–1 May 1976	Oklahoma; Cimarron Co.; near Kenton	Oklahoma B.R.C.

[a]See text for definition. When applicable, each record has been accepted by the local bird records committee (B.R.C.). Abbreviations: Co., county; N.W.R., national wildlife refuge; W.A., wildlife area.

[b]Two individuals, photographed.

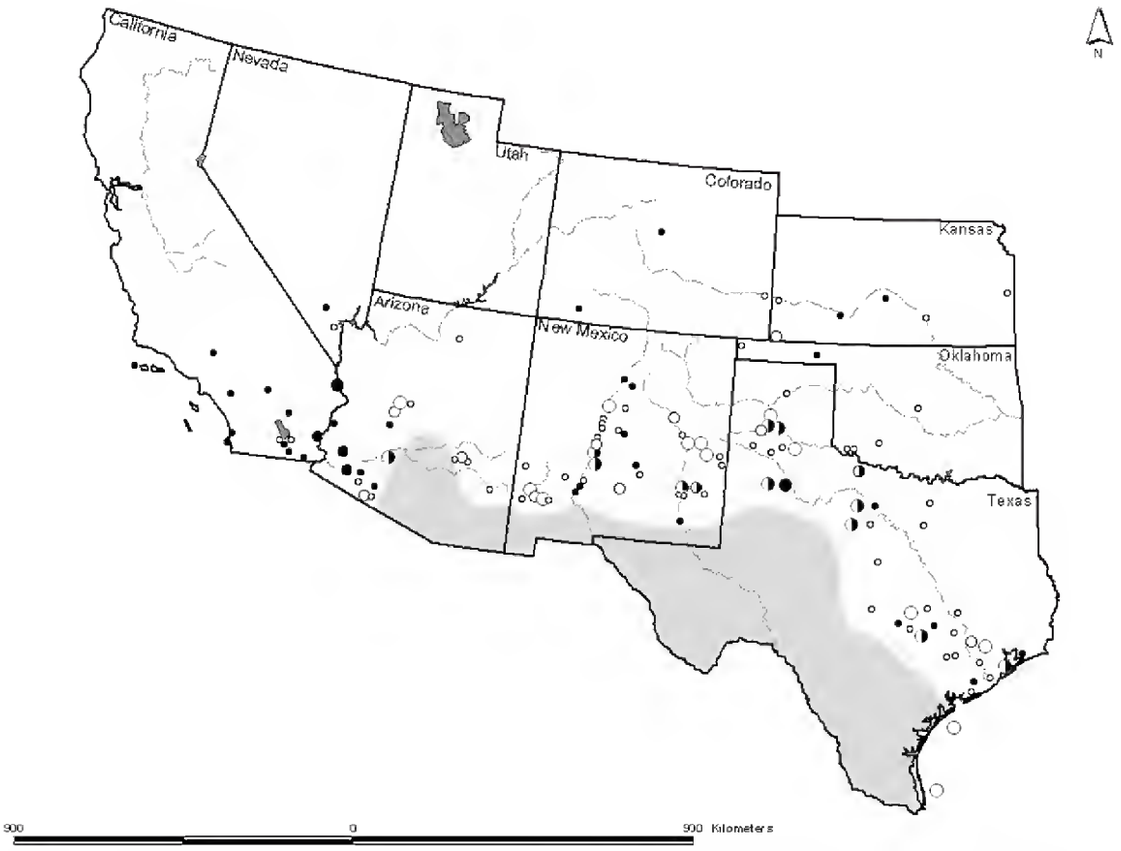

Figure 1. Extralimital records of the Pyrrhuloxia (*Cardinalis sinuatus*) in the southwestern United States. The shaded area represents the species' typical range (adapted from Phillips et al. 1964, Tweit and Thompson 1999, Lockwood and Freeman 2004, and Corman and Wise-Gervais 2005). Solid circles represent late spring or summer records (May–July), empty circles late fall or winter records (chiefly late October through April), and half-filled circles locales with records from both periods. Dot size varies from small (1 record for the locale) to medium (2 records) to large (3 or more records).

Colorado, 29–30 April 1999 (Lisowsky 2001); a bird at Billings, Montana, at least 13–16 December 2000 (Lenard et al. 2003); and a female photographed at Eagle, Elgin County, Ontario, 25 December 2004–1 January 2005 (Cannings 2005).

TIMING OF VAGRANCY

The timing of the Pyrrhuloxia's vagrancy is not random but it does not follow the "typical" pattern of vagrancy of birds appearing out of range during spring or fall migration. Rather, as Seyffert (2001) noted, "The Pyrrhuloxia is notorious for wandering northward after the nesting season," in this case meaning that out-of-range records hail from late fall and winter. This pattern is particularly evident in New Mexico and Texas (Figure 1), where the species wanders north annually along the Rio Grande to Socorro County, in the Pecos River basin to De Baca and Roosevelt counties (Parmeter et al. 2002), and into the southern Texas panhandle, generally on the Llano Estacado north to the Red River valley (Seyffert 2001). The Pyrrhuloxia also moves regularly at

this season to the Texas coast (Lockwood and Freeman 2004) east as far as Houston, where it has occurred as early as 30 October (Lasley and Sexton 1990). About 10 were recorded even on oil rigs in the Gulf of Mexico 22 October–2 November 1999 (Russell 2005). Records outside the breeding range in New Mexico and Texas typically extend from early November through March (Figure 2), although some birds have appeared as early as mid-October and others have lingered through April (e.g., Table 1).

In Arizona winter vagrancy is less pronounced, although there is "an influx of additional numbers in winter" to the Phoenix area (Witzeman et al. 1997), and the Pyrrhuloxia has wandered at that season north to other locales along the Gila River, west to Gila Bend (Monson and Phillips 1981). There are few winter records father north in Arizona, although the species has reached Skull Valley, Yavapai County (Witzeman and Stejskal 1985), and a male was photographed in Tuba City, Coconino County, 20 December 1986 (Witzeman and Stejskal 1987). Elsewhere in the Southwest, winter vagrants have reached southeastern California (Table 2; two records, one of a male that returned three consecutive winters, Patten et al. 2003) and Henderson, Nevada (a "well-photographed male" on the Christmas Bird Count 15 December 1979; Stotz 1980).

Vagrancy in late spring and summer is more limited, at least in New Mexico and Texas (Figures 1, 2). Nevertheless, there are scattered records between late April and late July from southwestern and central Colorado (see above), northern New Mexico (Hubbard 1978), and the southern Great Plains, here defined as Oklahoma, Kansas, eastern Colorado, the Texas panhandle north

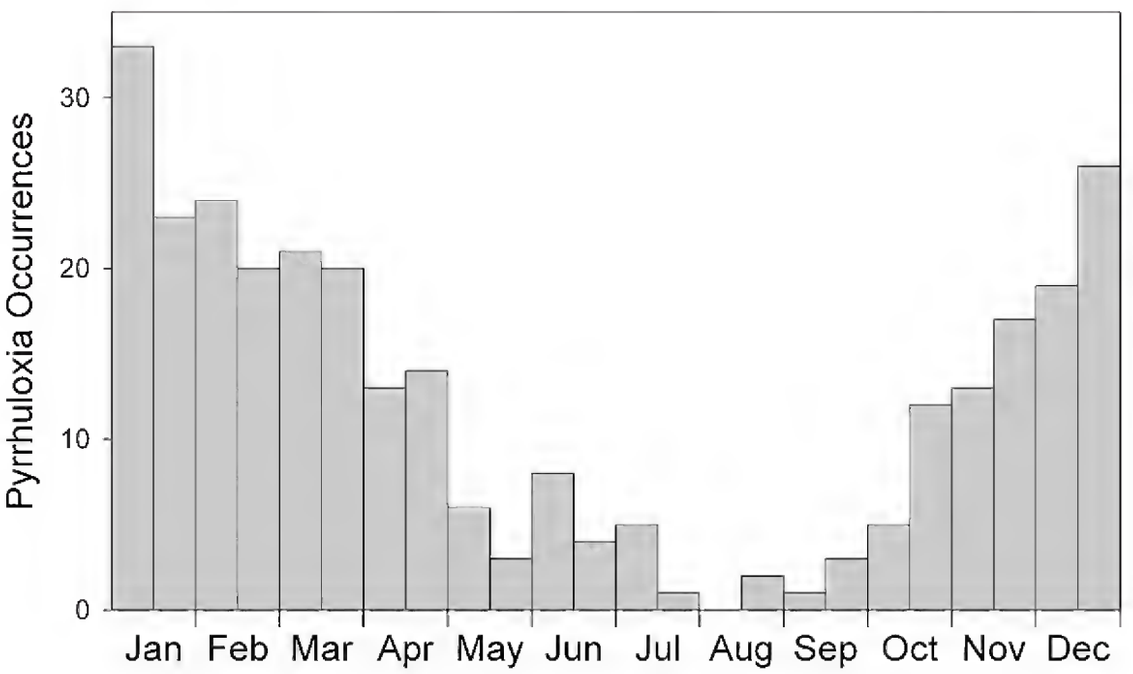

Figure 2. Seasonal occurrence of extralimital Pyrrhuloxias in New Mexico, Texas, and the southern Great Plains. Seasonal status is portrayed on the basis of ~200 records from Table 1 and gleaned from Pulich (1988), Seyffert (2001), and, especially, a 25-yr period (1978–2002) of the regional reports published quarterly in *North American Birds* and its predecessors (i.e., *American Birds* and *Field Notes*).

Table 2 Extralimital Records of the Pyrrhuloxia, Ordered by Time of Year, from and West of the Lower Colorado River Valley[a]

Date(s)	Location	Source
24 Feb–8 Mar 1971; 31 Dec 1971–27 Mar 1972; 22 Jan–23 Mar 1973	California; Imperial Co.; Heise Springs	McCaskie (1971)
7–10 May 1983	California; Los Angeles Co.; near Lancaster	California B.R.C.
14 May 1983	California; San Bernardino Co.; Chemehuevi Wash	California B.R.C.
15 May 1993	Nevada; Clark Co.; Corn Creek	*Am. Birds* 47:437
23 May 1974	California; Imperial Co.; Brock Research Center	California B.R.C.
26–27 May 1983	California; San Diego Co.; Encinitas	California B.R.C.
27 May 2002	California; Imperial Co.; near Palo Verde	California B.R.C.
28 May–8 Jul 1995	California; San Bernardino Co.; Chemehuevi Wash	California B.R.C.
28 May–5 Jun 1996	California; Imperial Co.; El Centro	California B.R.C.
1 Jun 1986	California; Riverside Co.; Cottonwood Springs	California B.R.C.
6 Jun–23 Jul 1977	California; San Bernardino Co.; Chemehuevi Wash	California B.R.C.
10 Jun 1998	California; San Diego Co.; Pt. Loma	California B.R.C.
4 Jul 1981	Arizona; La Paz Co.; near Ehrenberg	Rosenberg et al. (1991)
14 Jul 1974	California; Imperial Co.; Palo Verde	California B.R.C.
18 Jul 1974	California; Imperial Co.; Westmorland	California B.R.C.
19–23 Jul 1990	California; Santa Barbara Co.; San Miguel Island	California B.R.C.
23 Jul 1982	California; Riverside Co.; Corona	California B.R.C.
31 Jul 1999	California; San Bernardino Co.; Yucca Valley	California B.R.C.
15 Dec 1979	Nevada; Clark Co.; Henderson	*Am. Birds* 34:625
17 Dec 1972–19 Feb 1973	California; Imperial Co.; Calipatria	California B.R.C.

[a]When applicable, each record has been accepted by the local bird records committee (B.R.C.).

of the Canadian River, and north-central Texas north of the Brazos River. Farther west, however, spring and summer vagrancy is the rule: from and west of the lower Colorado River valley, 17 of 20 records fall between early May and the end of July (Table 2). A record of a female photographed in Costa Mesa, Orange County, 7 February–14 March 1999, was rejected by the California Bird Records Committee on the grounds of questionable natural occurrence. This record is perhaps best treated with caution given the season and the species' status in captivity in adjacent northwestern Baja California, where Hamilton (2001) noted up to five per day offered for sale in pet stores.

A few Pyrrhuloxias that strayed far from the species' normal range have bred. In California, the species has twice bred at Chemehuevi Wash, which drains into the Colorado River on the west side of Lake Havasu (Luther 1980, Garrett and Singer 1998). In Arizona, the species has bred near Wickenburg in northwestern Maricopa County (Monson and Phillips 1981) and was found in the Castle Dome and Mohawk mountains of Yuma County in the late 1950s (Phillips et al. 1964), where it presumably bred. In Texas, Oberholser (1974) listed breeding records east to Lee, Bastrop, and Travis counties on the Edwards Plateau, and the species has nested in the southern part of the panhandle (Seyffert 2001).

The difference in timing of vagrancy coincides with the geographic ranges of the two nonpeninsular subspecies. Reasons for apparent subspecific differences in dispersal timing are speculative, but perhaps they stem from differences in nest timing. Anderson and Anderson (1946) noted of Arizona *C. s. fulvescens*, "apparently, nesting does not occur very early." This statement may not be true in an absolute sense, but it does appear to hold relative to *C. s. sinuatus* in Texas. On the basis of egg-set data reported by Tweit and Thompson (1999: table 1, $n = 200$ nests), Arizona birds nest significantly later than Texas birds ($\chi^2 = 12.09$, df = 4, $P < 0.025$), possibly because some of the former forego nesting until the onset of monsoon rains (see Short 1974). If so—and the observation of dependent young in mid-October (Anderson and Anderson 1964) lends indirect support—then perhaps Pyrrhuloxias in Texas and New Mexico routinely fledge sooner than those in Arizona, allowing them to disperse sooner as well. Regardless of the underlying cause, the seasonality of vagrancy of presumptive *C. s. sinuatus* and *C. s. fulvescens* differs strikingly, suggesting avenues for future research into comparative dispersal patterns between the subspecies.

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Pyrrhuloxia

Sketch by Narca Moore-Craig

NOTES

NESTING OF FORSTER'S TERN IN A TROPICAL COASTAL LAGOON, CUYUTLÁN, COLIMA, MEXICO

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Forster's Tern (*Sterna forsteri*) nests mostly from central Canada to the central United States and has scattered colonies along both coasts of North America, south to northern Baja California along the west coast and to northern Tamaulipas along the east coast (Palacios and Alfaro 1991, Howell and Webb 1995, AOU 1998, McNicholl et al. 2001, Molina and Garrett 2001). In much of Mexico, Forster's Tern is a common winter resident (Howell and Webb 1995, AOU 1998). During 2005, while doing field work on gulls and terns nesting in Laguna Cuyutlán, Colima, Mexico, we discovered 10 pairs of Forster's Terns nesting.

Laguna Cuyutlán is a large coastal lagoon (35 km long, 7200 hectares), oriented southeast–northwest and bordered by thickets of mangrove (Mellink and de la Riva 2005). The lagoon is surrounded by tamarind, mango, and lime orchards, and by some pasturelands. The urban area of the city of Manzanillo lies at its northwestern end. In the northwestern section of the lagoon, a number of dredge-spoil islands give evidence of past dredging in that area. The deeper parts of the northwestern and middle sections of the lagoon are heavily fished, while the extensive shallows along the southeastern shores are used for salt extraction (Mellink and de la Riva 2005).

The southeastern shore of the middle section of the lagoon is very shallow and dotted with small, muddy islets a few meters wide and from a few tens of meters to over 100 meters long. These islets are covered largely with *Batis* and *Salicornia* (Mellink and de la Riva 2005). It was on three such islets that Foster's Terns were nesting. All nests examined were made of dead stems of those two plant species, built on bare ground, but adjacent to the vegetation. Sixteen eggs measured 41.89 ± 1.63 mm long and 29.63 ± 0.97 mm wide (mean ± standard deviation).

On 14 May, through a spotting scope, we detected five Forster's Terns in incubation position on the first islet (19° 00′ 25″ N 104° 10′ 49″ W). Two other terns performed defensive dives on us. We identified the species by bill coloration, long forked tail, and harsh voice. Photographs we took were later confirmed by Philip Unitt. On one occasion all the adults that seemed to be on nests took flight, apparently in response to the sound of a trailer truck on the nearby highway. The terns landed less than a minute later in the same places from which they had come, strengthening our suspicion that they were nesting. We could not examine the nests directly at that time because access was hindered by a low water level (<10 cm) and soft muddy bottoms.

On 23 May an adult flew over the colony with a fish in its bill but failed to land after several passes. There were two chicks less than a week old (on the basis of plumage coloration and size) begging for food on the ground. At this time, with adequate footwear, we were able to inspect the colony directly. We found five nests with eggs: three nests contained three eggs each, one contained two eggs, and one contained one egg. The two chicks were hiding among the vegetation away from their nest, and they might have been from the nest with one egg, which was close to them. At

least three Laughing Gulls (*Larus atricilla*) were on nests in the same area, one very close to the Forster's Terns. Also on 23 May we found a second islet with incubating Forster's Terns (19° 00′ 27″ N 104° 10′ 32″ W). From a distance, three adults appeared to be on nests, but we could find only two nests: one contained three eggs, the other, one egg. There was a chick less than a week old that could have belonged to the latter nest.

On 3 June we monitored the islets by using a spotting scope. On the first islet there were three adults incubating, and two nests clearly visible were empty. We saw one chick between 3 and 4 weeks old, but there could have been more. On islet 2 we observed one adult in incubating position, one standing, and one chick between 1 and 2 weeks old. On this date we found a third islet north of and very close to islet 1. On it were another three adults in incubating position. We did not visit this islet.

On 2 July the water level had risen about 30 cm above the level on our previous visit, as a result of the spring tides of 22–23 June, and the Forster's Terns' nesting islets were under water. We did not see any Forster's Terns in the area, but because the chicks are able to swim at a very early age, we suspect that those not yet able to fly swam to nearby higher islets.

In 1959 Schaldach (1963) found Forster's to be the most common tern in Colima from May to September, and he speculated that the species might have bred not far from the northwestern boundary of that state. The colony that we report here is 1730 km from the closest Baja California breeding locality (Palacios and Alfaro 1991) and about 1000 km from the closest one in Tamaulipas (Howell and Webb 1995), albeit over very high, mountainous country. The northernmost confirmed colonies are at about 55° N (McNicholl et al. 2001), and therefore the known breeding distribution of Forster's Tern now spans over 36° of latitude. This is one of the largest latitudinal distributions of any coastally nesting North American tern. The Roseate Tern (*S. dougallii*) and Caspian Tern (*S. caspia*) nest over about 35° 40′ and 35° of latitude, respectively, but the Common Tern (*S. hirundo*) nests over about 48° of latitude (as derived from AOU 1998).

In western North America, the few data available suggest that the species has spread outward from the interior of the United States, establishing new colonies in San Francisco Bay, California, in 1948, then south along the west coast to San Diego and northern Baja California (McNicholl et al. 2001) and north to British Columbia. Although no pertinent specimens exist in Mexican collections, Schaldach's (1963) comment opens the possibility that Forster's Terns already nested in southern Mexico several decades ago.

In Laguna Cuyutlán, Forster's Terns nest on islets that are very difficult for people to reach. Indeed, more Forster's Terns may nest in areas even more difficult of access than those we visited, as that part of the lagoon is dotted with islets that seem suitable. Furthermore, there is no incentive for people to visit these islets. We did not see any sign of predation on any of the nests, but we documented some predation in a nearby colony of Black Skimmers (*Rynchops niger*), possibly from Raccoons (*Procyon lotor*), whose tracks are common on the islets and as suggested by the way eggshells were opened. We have recorded tracks of the American Crocodile (*Crocodylus acutus*) on some of the islands, but they appeared to represent only occasional visits. If crocodiles prey on the chicks of larids, they probably target larger colonies of more gregarious species such as the Royal Tern (*Sterna maxima*) and Laughing Gull, at least from the tracks we have seen. Laughing Gulls and Gull-billed Terns (*Sterna nilotica*), which also nest in the area, are other potential predators. On the other hand, any fluctuations in the abundance of small fish could affect the Forster's Terns, as well as other bird species nesting in Laguna Cuyutlán. However, there is no information on the dynamics of the fish community or on the factors regulating local fish populations.

The nesting ecology of Forster's Terns, and of other waterbirds, in Laguna Cuyutlán is closely linked to water levels in the lagoon. Therefore, the intended dredging of the

artificial channels that connect the lagoon to the sea, which would increase the water level permanently, is probably the major threat to them. There are three reasons for the potential higher water levels. Fisheries authorities argue that such an increase in water level is necessary to prevent fish die-offs and to enhance fishing. Current plans to construct a re-gasification terminal also include dredging the channels, to permit the entrance of large ships. Finally, the state government may be planning to construct inside the lagoon a terminal for container ships, for which dredging is also necessary.

The full significance of our record cannot be assessed currently, but the distance to the closest colony of the same species and the fact that Forster's Terns are nesting in true tropical conditions seem of great interest. Further work should be done to determine the total number of Forster's Terns breeding in Laguna Cuyutlán, as well as to determine year-to-year variations.

Jorge Luis Ramírez guided and transported us through the Laguna Cuyutlán shallows, and Jorge Aguilar Torres took us along the dredge islets of the western part of the lagoon. Field work in Laguna Cuyutlán was supported by a grant from the U.S. Fish and Wildlife Service to E. Palacios and E. Mellink, administered by PRONATURA–Mar de Cortés (La Paz office). Eduardo Palacios provided logistical support. Philip Unitt verified our tern photographs, and Richard Erickson, Robert Hamilton, and an anonymous reviewer kindly helped to improve this article. Our thanks to all of them.

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GIANT CANADA GOOSE IN WASHINGTON

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On 4 December 2004 Granstrand found and photographed Washington's first fully documented Giant Canada Goose (*Branta canadensis maxima*) of apparently wild origin near Yakima, Yakima County (Figure 1). On 15 January 2005 he found another at Ice Harbor Dam, Walla Walla County (Mlodinow et al. 2005). Figure 1 shows that the bird at Yakima had white extending back from the top of the cheek patch as well as a white bar across the forehead. Both marks typify *maxima*, though occasionally other subspecies of the Canada Goose display them, as do some intergrades (Hanson 1997). Additionally, *maxima* is typically somewhat whiter breasted than *B. c. moffitti* (Hanson 1997), the common large Canada Goose of Washington and surrounding states and provinces (Johnsgard 1975, Bellrose 1976), and this is evident in Figure 1. Also detectable in the photograph is that the white cheek strap meets the base of the bill. This mark is often present in *maxima* and is atypical of other taxa (B. Jones in litt). Granstrand also noted this bird's being larger than the nearby examples of *moffitti* and its proportionately longer neck (not readily evident in the photograph because of the bird's posture), both features suggesting *maxima* (Hanson 1997).

In 1957, *maxima* was thought to be extinct, with a former breeding range said to extend from North Dakota and Minnesota south to Kansas, northern Arkansas, Tennessee, and western Kentucky (A.O.U. 1957), and perhaps north to Alberta and Manitoba (Hanson 1997). In January 1962, however, Hanson (1997) found numerous examples of *maxima* in the vicinity of Rochester, Minnesota. A large and successful reintroduction effort ensued. Giant Canada Geese now breed from northern Manitoba south through western South Dakota to southern Illinois and Missouri, though the exact extent of its range is obscured by extensive intergradation with other races of the Canada Goose, partly as a result of these restoration programs (Johnsgard 1975, Bellrose 1976, Mowbray et al. 2002). Since 1962 numbers of the Giant Canada Goose have increased rapidly, with Bellrose (1976) estimating 20,000 wintering in the Tennessee Valley and 8000 in the Mississippi Valley, plus a few along the Atlantic coast. The subspecies' total population was estimated at 800,000 in 1993, 1,400,000 in 2001 (Mowbray et al. 2002), and 1,583,100 in 2005 (U.S. Fish and Wildlife Service 2005). *Branta canadensis maxima* is nonmigratory in the southern half of its range, but the more northerly populations are migratory, including a molt-migration that takes birds north to the shores of Hudson and James bays (Mowbray et al. 2002).

In the Pacific Northwest, a private individual introduced the Giant Canada Goose into northwestern Oregon during the 1930s (Marshall et al. 2003), and government agencies introduced it into southwestern Washington during the 1970s (Wahl et al. 2005). Neither population became established, partly because of extensive interbreeding with local *B. c. moffitti* and, to a lesser extent, introduced *B. c. occidentalis* (Marshall et al. 2003, Wahl et al. 2005). There are no known introductions or vagrants of wild origin of *maxima* in Montana (D. Casey, J. Hansen in litt.) or Idaho (D. Trochlell in litt.).

The bird photographed in December 2004, however, was almost certainly not the first *B. c. maxima* of wild provenance in the Pacific Northwest. Between 1985 and

2001 Schonewald (unpubl. data) harvested 11 large (8.5–10 kg) Canada Geese within Washington's Columbia Basin, near Moses Lake, Grant County (four on 29 November 1986; one on 30 December 1989; two on 20 November 1993; one on 1 January 1994; three on 21 November 1998). By size alone these birds were probably *maxima*, as these weights fall outside the range of *B. c. moffitti* (Yocum 1972, Hansen 1997). Each also displayed the head markings characteristic of *maxima* discussed above, and each had a pink or pinkish undersurface to the mandible, a mark indicating *maxima* (B. Jones in litt.). Schonewald noted that these exceptionally large geese gave a call deeper than that of *B. c. moffitti*, the common large Canada Goose of Washington. All were taken from family groups, implying a wild rather than captive origin. None of the specimens, however, was preserved. Finally, a Canada Goose banded in South Dakota (where only *maxima* breeds) on 15 July 1974 was recovered near Vancouver, British Columbia, on 9 October 1982 (Tallman et al. 2002).

The recent upsurge of interest in subspecific identification of the Canada and Cackling Geese (the latter split as *B. hutchinsii*; Banks et al. 2004) led Granstrand to scrutinize Canada Geese in eastern Washington during the winter of 2004–2005 and notice the two examples of *maxima*. This race is not rare in captivity (M. Axelrod, P. Dye in litt.), but the historical evidence of individuals shot from family groups during the last 20 years and the recovery of a banded bird in southwestern British Columbia suggest that *B. c. maxima* may be a natural vagrant to eastern Washington. Its frequency may be on the increase.

Many thanks to Bob Jones of the Canadian Wildlife Service for his insights on Giant Canada Goose identification and for improving an earlier version of the manuscript. This manuscript also benefited from the attentions of Paul Springer and Bruce Deuel; their knowledge is greatly appreciated. Thanks as well to Dan Casey, Jim Hansen, and David Trochlell for providing information on *maxima* in Montana and Idaho and to Maynard Axelrod and Paul Dye for sharing information on captive birds.

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Figure 1. Giant Canada Goose (*Branta canadensis maxima*) near Yakima, Washington, 4 December 2004.

Photo by Denny Granstrand

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FIRST VERIFIABLE RECORD OF THE FLESH-FOOTED SHEARWATER FOR MEXICO

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On 31 March 1996 we observed two Flesh-footed Shearwaters (*Puffinus carneipes*) about 10 nautical miles west of Islas Los Coronados in northwestern Baja California, Mexico. The birds were seen about midday, during a pelagic birding trip arranged by the Cooper Ornithological Society. The skies were clear with a light wind, resulting in excellent viewing conditions. We watched the shearwaters carefully as they circled the boat several times over 15 minutes, and Radamaker made brief notes of the field marks.

The birds were similar in size and shape to nearby Pink-footed Shearwaters (*Puffinus creatopus*) with a similar slow, languid wingbeat, quite different from the fast, stiff wing beats of numerous Sooty Shearwaters (*P. griseus*) also present. The Flesh-footed Shearwaters were distinguished from the Pink-footed by their uniform chocolate brown coloration and from the Sooty by their pale pink bills and feet, larger size, languid flight style, and dark underwings. If the Pink-footed has a dark morph, as implied by del Hoyo et al. (1992) and reported by Steve N. G. Howell (pers. comm.), it is so rare the likelihood of two together is vanishingly small.

Knowing that the Flesh-footed Shearwater is rare in Mexico, Radamaker asked fellow birder Betty Siegel to take photographs of the shearwaters. She took several slides, but initially none appeared to support the identification conclusively. Nine years later, however, Radamaker had Larsen Photographic Labs convert the original slides to high-resolution digital images, and one of the converted images (Figure 1)

Figure 1. Flesh-footed Shearwater ~10 nautical miles west of Islas Los Coronados on 31 March 1996. Note the long, flesh-colored bill with dark tip and the bird's overall dark brown coloration.

Photo by Betty Siegel

appears sufficient to corroborate the identification of a Flesh-footed Shearwater—the first photographic record of the species for Mexico.

The Flesh-footed Shearwater is a transequatorial migrant in the Pacific and Indian oceans. During the austral summer the species is found primarily off Australia and New Zealand, and during the austral winter it disperses through much of the Indian Ocean and north into the Pacific Ocean, with some of the Pacific population moving east into waters off western North America (Marchant et al. 1990). Along the Pacific coast of North America the Flesh-footed Shearwater is uncommon but regular from the Gulf of Alaska south to northern California (American Ornithologists' Union 1998), and off southern California it is a very rare visitant from April to late November, accidental in midwinter (Garrett and Dunn 1981). In San Diego County it is very rare, with 11 records between 9 April (1996) and 9 September (1972), aside from an unseasonal record from La Jolla on 13 February 2001 (Unitt 2004).

The Flesh-footed Shearwater's distribution in Mexico is unclear. Pitman (1986) mapped approximately a dozen sightings from waters off the Baja California Peninsula and the Mexican mainland south to the vicinity of Islas Revillagigedo, but no specific dates or species accounts accompany the data. Pitman's work formed the basis of the status and distribution described by Howell and Webb (1995), but Howell et al. (2001) considered the species to be of hypothetical occurrence in waters off the Baja California Peninsula, citing a lack of specific documented reports.

Photographic confirmation of the Flesh-footed Shearwater in Mexico was not surprising, considering its status in adjacent southern California and the several reliable sight reports from Mexico, including two recent ones from Baja California: one between Islas San Benito and Isla Cedros on 2 May 2001, and three offshore south of Ensenada on 20 May 2001 (S. Wolfe *fide* Richard Erickson). Still, the true status and distribution of the Flesh-footed Shearwater in Mexico remain uncertain, and future sightings should be documented carefully.

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FIRST RECORD OF THE EASTERN SCREECH-OWL IN NEW MEXICO

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Early on the morning of 18 November 2003, Avery encountered a calling Eastern Screech-Owl (*Megascops asio*) in an elm tree (*Ulmus* sp.) adjacent to the campus of Eastern New Mexico University in Portales, Roosevelt County, New Mexico. The bird was then photographed and tape-recorded on 20 November by Avery and Keller (Figure 1).

The bird was identifiable as an Eastern Screech-Owl by its sustained tremolo call and intermediate rufous plumage. In the Great Plains, 7% of all Eastern Screech-Owls are of the rufous morph (Sibley 2000). Local Western Screech-Owls (*M. kennicottii*) should not be rufous, as in the Western any coloration other than gray is known only in subspecies *M. k. kennicottii* of the coastal Pacific Northwest (Cannings and Angell 2001). The Eastern Screech-Owl at Portales gave a 3- to 4-second tremolo call on one pitch, repeating it approximately every 15 seconds. These bouts of singing often lasted for 20 minutes or more.

The owl was observed frequently through the end of 2003. During 2004, encounters with the calling bird were regular, and observations continued until early September. The owl resumed calling in late October and was observed until May 2005. It reappeared again in March 2006. Over the time it was observed, the owl shifted its center of activity from elm trees in a residential neighborhood during the winter of 2003–04 to the center of the university campus, where it was frequently found in black locust trees (*Robinia pseudoacacia*) surrounded by open lawn. The total distance moved from one center of activity to the other was about 400 m to the southwest. The owl often was seen perched low in a lone black locust tree on the campus grounds approximately 75 m from any vegetation other than tended grass.

The nearest records of the Eastern Screech-Owl are from the panhandle of Oklahoma, southeastern Colorado, and western Texas, primarily from Amarillo and Lubbock, which are both >130 km to the northeast and southeast, respectively, from Portales, which lies in New Mexico's eastern plains (Gehlbach 1995, 2001, Seyffert 2001, National Audubon Society 2002, Reinking 2004). The Eastern Screech-Owl appears to be expanding its range slightly to the north and west, possibly as a result of increased urbanization (Gehlbach 1995, 2001). It is an omnivorous species, enabling it to occupy a range of habitats broader than most other owls' (Elphick et al. 2001). It is found frequently in urban environments, using nest-boxes for nesting and roosting.

This bird was considered a resident because of its presence throughout the summer months of 2004. Eastern Screech-Owls typically begin nesting in early March with fledglings hatching in May (Gehlbach 2001). In spite of its presence through summer 2004, the Eastern Screech-Owl at Portales was never seen with another owl and is presumed to have been a single individual.

This record is considered the first of the Eastern Screech-Owl for New Mexico by the New Mexico Bird Records Committee (record number 2005-09). Many birders and ornithologists from throughout New Mexico, California, and Arizona traveled to see this owl. As is typical of the Eastern Screech-Owl, it was relatively tame.

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Figure 1. Eastern Screech-Owl (*Megascops asio*) in Portales, New Mexico. First state record for New Mexico, photographed 20 November 2003.

Photo by Julian D. Avery

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AMERICAN CROWS MOVE INTO SOUTHERN IDAHO TOWNS

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The American Crow (*Corvus brachyrhynchos*) is now a common year-round resident in southern Idaho towns (pers. obs., C. Trost pers. comm.). Yet this was not always so. Larrison et al. (1967) and Burleigh (1972) found crows common in a variety of open habitats, but not specifically in towns. Burleigh (1972) sometimes listed a town in his county-status summaries, but this reference represented a general area. For example, for Ada County he stated that American Crows were "apparently resident at Boise" but continued with "on November 7, 1957, numerous flocks were seen in the open fields." He cited Newhouse (1960) as stating that the American Crow was common at Council, and Davis (1935) listed it as a winter visitor at Rupert; but these authors were referring to the region around these towns, not within them. The only specific reference to American Crows within a town by either Larrison et al. (1967) or Burleigh (1972) was the latter's of "a noisy flock of sixteen birds noted well within the town limits of McCall March 19, 1967; ground that day covered with several feet of snow." Apparently the fact that they were within town was noteworthy.

American Crows were not found within Nampa from the 1960s through the mid 1970s while I lived there. I first recorded them in Nampa in December 1979, while Leon Powers (pers. comm.) first found them there the previous winter. At Pocatello, C. H. Trost (pers. comm.) thought he first noticed them within city limits in the late 1970s but did not record them in field notes until 1980. The Boise Christmas Bird Count (hereafter CBC), covering a circle primarily of town but also including sagebrush desert, mountain, and limited agricultural land, recorded only a single American Crow from 1966 to 1975 (Figure 1). The count's number of crows averaged five from 1976 to 1980, then increased quickly, reaching 110 by 1983. This pattern contrasts with the thousands recorded consistently since the 1950s on the nearby rural Nampa CBC (Figure 2).

Thus it appears that crows first moved into southern Idaho towns in the late 1970s

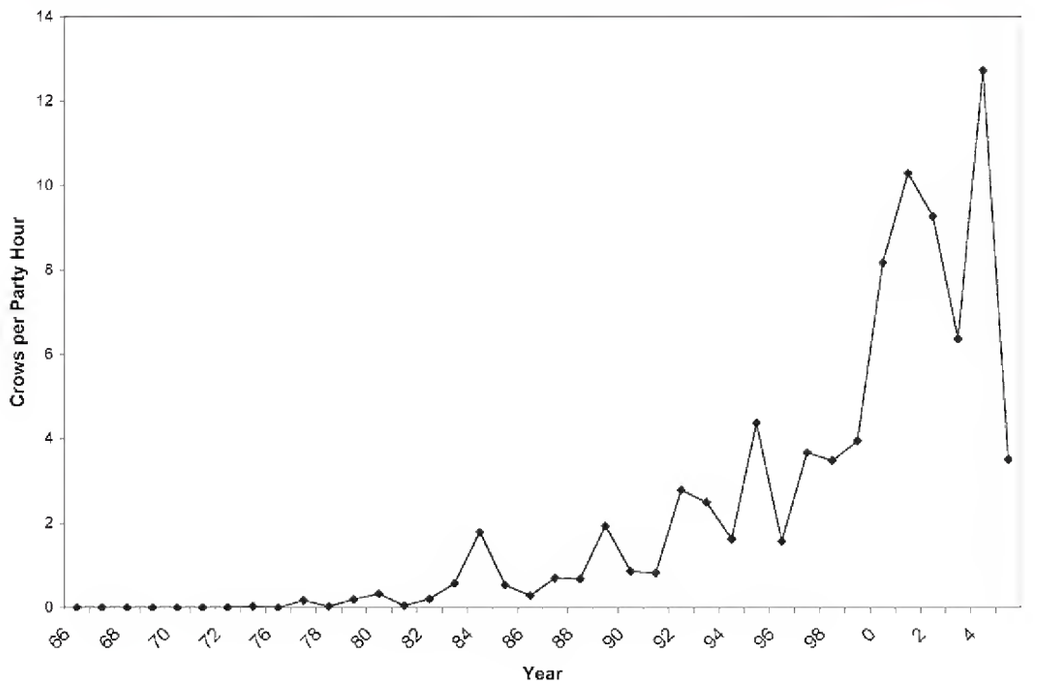

Figure 1. Number of American Crows per party-hour on the Boise Christmas Bird Count, 1966–2005.

or 1980. Veerbeek and Caffery (2002) reported that crows began moving into urban areas in the 1950s and 1960s and specifically mentioned urban roosts forming in Kentucky in 1977 (Hudson 1977) and in Saskatchewan in 1978 (Houston 1980), a time similar to when they did so in Idaho.

When I arrived at Pocatello in the winter of 1980/1981, there was a winter roost of about 40 crows near the Idaho State University campus. This roost grew consistently over the years, until it reached 800 to 900 birds by 1997. I also observed the number of crows nesting in Pocatello increase dramatically. During this same period Leon Powers (pers. comm.) found a large increase in nesting and roosting crows in Nampa. Suburban habitats, which by the definition of Marzluff et al. (2001) include southern Idaho towns, are favorable for crows' nesting, providing both trees for nest sites and food (Marzluff et al. 2001, McGowan 2001). The increase in southern Idaho's urban crows is paralleled in cities of the Pacific Northwest, where crows have learn to exploit rich food and nesting opportunities (Marzluff et al. 2001).

But why did American Crows first decide to move into Idaho towns? Large increases in rural populations could be a stimulus for invading towns. American Crows have increased in general in the interior western United States in the 20th century, in parallel with the development of agriculture (Marzluff et al. 1994). Rapid growth of crow populations in Seattle was fueled by immigration of juvenile crows from outlying areas (Withey and Marzluff 2005). Information on the crow's population dynamics in southern Idaho is limited and contradictory. The Breeding Bird Survey from 1966 to 1979 implies a significantly positive trend (increase of 6.1% annually; $P = 0.02$; Sauer et al. 2005), but Idaho CBCs from 1959 to 1988 imply a negative trend (Contreras 1997). American Crows were abundant around some southern Idaho towns for decades before moving in. For example, from the mid 1950s through early 1970s Nampa CBCs (Figure 2) usually had from 500 to 8000 American Crows. It is possible that increasing rural crow populations contributed to the initial colonization of Idaho towns, but the historically large populations previous to colonization indicate that other factors were important.

One likely cause was a change in persecution of American Crows in southern Idaho, at least in towns, as had been suggested in Canada (Houston 1980), Wisconsin (Knight et al. 1987), and generally in North America (McGowan 2001). Larrison et

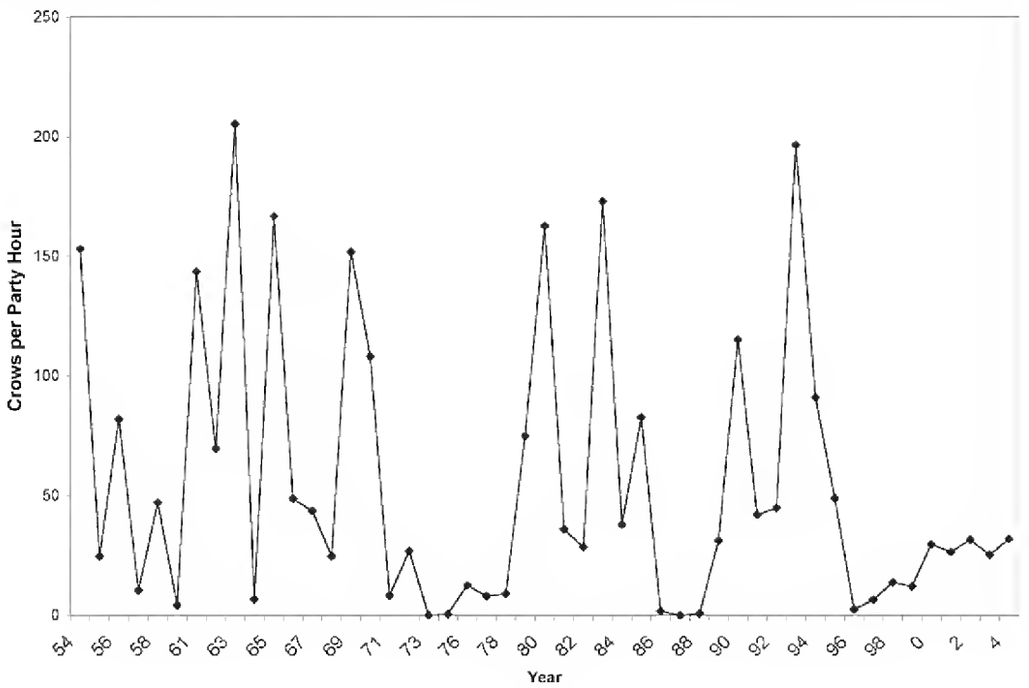

Figure 2. Number of American Crows per party-hour on the Nampa Christmas Bird Count, 1954–2005.

al. (1967) reported that crows were often persecuted to the point of extirpation from areas where they were formerly common. In the Nampa area through the 1960s and early 1970s they were considered one of the worst varmints, and boys of all ages were encouraged to kill them (pers. obs.). Crows were remarkably wary during this time, consistently staying well out of gunshot range.

My impression is that attitudes toward winged predators became less negative in general in southern Idaho by the mid to late 1970s. This change included crows, at least as far as hunting them within city limits. Factors contributing to this attitude change probably included the 1972 extension of the Federal Migratory Bird Treaty Act of 1918 to protect crows for the first time, and the establishment of the Snake River Birds of Prey National Conservation Area in southwestern Idaho in the early 1970s.

I thank Charles H. Trost and Leon Powers for their helpful insights and information. Terrell Rich and John Marzluff provided excellent comment on the manuscript.

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BOOK REVIEWS

Hawks from Every Angle: How to Identify Raptors in Flight, by Jerry Liguori. 2005. Princeton University Press. 132 pages, 339 color photos, 7 b/w photo plates, 2 maps. Paperback $19.95 (ISBN 0-691-11825-6); hardback, $55.00 (ISBN 0-691-11824-8).

Hawks are among the most spectacular birds in North America, and there have been several raptor-identification books published in recent years—so why another? In 1988, *Hawks in Flight*, by Pete Dunne, David Sibley, and Clay Sutton, broke new ground in North America by taking raptor identification beyond Peterson's field-mark system. Identifying raptors in flight is as much art as science, and it is difficult at best to convey what exactly it is that experienced hawk watchers use to name birds at long range, and at those real-life angles birds assume. *Hawks in Flight* still stands as a landmark, with numerous superb line drawings and a good number of (poorly reproduced) black-and-white photos showing hawks "as they really are." *Hawks from Every Angle* also attempts to distill decades of hard-won knowledge into a field-friendly format. It is perhaps inevitable to liken Liguori's work to a succinct, more standardized version of *Hawks in Flight*, with the benefit of color photos, but these differences are attributes and will help make *Hawks from Every Angle* the new bible for hawk watchers.

One of the book's great strengths is its brevity. Unlike Brian Wheeler's two-volume tome (reviewed in *Western Birds* 34:252-253, 2003), which treats field marks in impenetrable detail, *Hawks from Every Angle* cuts to the chase. The 13-page introduction introduces the subject: the in-flight identification of the "22 raptor species…that most commonly occur at migration sites throughout the United States and Canada" (the Turkey and Black vultures are included in this total, even though they are not raptors). A brief glossary with three labeled figures of anatomy, discussions of light conditions, molt, aberrant plumages, hawk migration, and migration sites (with two maps), is followed by three tables that show, for 20 species, the spring and fall timetables of migration and North American daily and seasonal high counts (including Veracruz, Mexico). Then come the identification texts, grouped in five sections and nicely laid out: accipiters; the Northern Harrier; buteos; falcons; and, last, the two vultures, Osprey, and eagles. A short bibliography (18 of the 28 titles listed are by Liguori) and index complete the book, which I read in just a couple of hours—two of the most informative hours I've spent in a long time.

Largely standardized from group to group, the text sections all start with an overview of identification characters and migration behavior and timing. Then come a synthesis of plumage features (grouped either by age or morph, depending on which is most likely to be distinguishable under field conditions), sometimes a discussion of similar species and identification pitfalls, and then a section on flight style, including comparisons of shapes as viewed soaring, head-on, overhead, and wing-on/going away (wing-on being the side view of a bird at eye-level). Well-chosen adjectives make the flight-style descriptions particularly useful. Boldface type is used to highlight pearls of wisdom and suggest caution, as in the bolded text (p. 28): "The tail tip of all accipiters appears squared off when headed away; however, the tail of Sharp-shinned Hawks looks especially shortened." Unfortunately, the comparatively short tail of the Sharp-shinned Hawk is not shown by the photos, which highlights a problem with this kind of book: codifying one's intuition is difficult enough, but finding photos to portray such subtleties is almost impossible. Identifying distant hawks involves constant re-evaluation as a bird turns or approaches, but this dynamism simply cannot be conveyed by photos.

Still, each section has well-chosen color photos of identifiable age and sex classes (mainly in overhead soaring poses) with pithy captions that highlight pointers for

species, age, or sex. These color photos were chosen to show plumage features, but they are also instructive for shape, especially when composite photos compare similar species (e.g., the excellent photo for CH Pitfall 03, page 24, showing a juvenile Cooper's Hawk and Northern Goshawk). Both dorsal and ventral surfaces are shown, usually with the sexes or ages in roughly comparable poses—in itself a remarkable achievement and a labor of time and love. At the end of each section are composite black-and-white photo plates, with similar species shown the same size (the sky is notably lacking in rulers) in soaring, head-on, gliding, wing-on, and going-away poses. Annotated pointers draw one's attention to important distinguishing features, such as tail and wing shapes. The two pages of accipiter plates alone, with 24 individual photos comparing the three species, are worth the price of the book.

What shines through are the author's extensive experience and his strong desire to share as much of his knowledge as possible. For example, more than once I've mistaken a Double-crested Cormorant for a Peregrine Falcon (when they're flying head-on), perhaps as often as I've confused the Peregrine and Prairie falcons. Liguori compares the flight manner of the Peregrine to that of cormorants, which makes me feel better—it's a real-life problem. Surprisingly, though, no mention is made of the pitfalls of pigeons, or even of martins, which can be confused with falcons. Sometimes, depending on light or distance, you just can't identify a raptor to species, or age, or sex, and Liguori acknowledges these limitations to hawk watching. He doesn't insist that every hawk can be identified, which is refreshing—and sobering, coming from an expert.

Obviously I like this book, but does it have drawbacks; could it be improved? Well, for such a short book the editing is particularly poor. Copy editors with birding knowledge are rare, and few birders are expert at conveying information clearly. On p. 102, "a pale grayish white head," beyond lacking a hyphen, seems rather odd phrasing—what does a dark grayish-white head look like? I remain bewildered by the definition of "primary projection" in the glossary. After reading the book I thought I had it figured out, but in talking to a colleague familiar with raptors I learned he was equally sure it meant something quite different. We both left the conversation completely uncertain what the term means in *Hawks from Every Angle*. Sentences such as "Intergrades that inherit traits of both parents are extremely difficult to specifically categorize" (p. 53, in reference to offspring of mixed races or morphs of the Red-tailed Hawk) is a bizarre sentence that even a neophyte copy-editor should have flagged. Birds have been endowed with gender (misused for sex on p. 28), and terms such as "broad" and "stocky" could have been defined; for example, on p. 83, the Broad-winged Hawk going away has stocky wings, whereas the Red-tailed Hawk has broad wings. And so on.

But my two main gripes are photo dates and molt, which are linked. I find it incredible that something as simple as the date (even the month) is omitted from a book that purportedly deals with the subtleties of identification. For example, many of the Swainson's Hawk photos show molting birds—but when were the photos taken? As in other raptor identification guides, it is sadly evident that the huge interest in hawk-watching is in inverse proportion to correct use of age terminology, knowledge of molt, and its application by hawk-watchers to age and species determination. Oh, and the California subspecies of the Red-shouldered Hawk is barely treated, indicating an eastern (or, at least, not western) bias.

So, the second edition could be copy-edited and include dates in the photo captions. But despite these gripes I loved this book. It's short but sweet and rich, like so many views of hawks and falcons. As the book's introduction states, *Hawks from Every Angle* is designed to help birders of all skill levels identify raptors in flight. It succeeds admirably in this goal, and Liguori is to be commended for writing this fine book.

Steve N. G. Howell

FEATURED PHOTO

DELAYED PREFORMATIVE MOLT IN THE BARN SWALLOW

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The Barn Swallow (*Hirundo rustica*) is among those passerines whose molt follows the "complex basic strategy" (Howell et al. 2003). This means that adults have only a single (prebasic) molt each plumage cycle, whereas first-year birds have an additional preformative molt (traditionally termed the first prebasic molt) in their first plumage cycle, bridging the period between juvenal plumage and entry into the adult cycle. In most passerines the preformative molt is partial, but in swallows it is complete, or nearly so. That is, the young birds replace all of their feathers with a plumage essentially identical to that of the adult, and this plumage is worn through their first breeding season. In North American Barn Swallows (*H. r. erythrogaster*) both the definitive prebasic and preformative molts take place primarily on the winter grounds, the former between August and February, the latter between October and April (Pyle 1997). Thus the latest first-cycle birds should complete growth of their outer primaries in April.

On 11 April 2004, Howell observed a first-cycle Barn Swallow that was just starting its preformative molt. The bird was at the Bolinas sewer ponds, Marin County, California, with a mixed-species flock of other swallows that included another ten Barn Swallows, all of which were in fresh adult or adultlike plumage, as expected at this time of year. The molting bird was mostly in very worn and faded juvenal plumage: the upperparts were dull, brownish blue with scattered whitish spots on the back that may have represented shed feathers; the underparts were dirty whitish overall, with a few blotches of darker, cinnamon feathering (i.e., fresher and incoming feathers); the tail was forked but lacked adultlike streamers (i.e., a typical juvenal tail); and, perhaps most conspicuously, the wings were in molt, with the inner two or three primaries just shed or possibly starting to grow anew. The outer seven or eight primaries were old and faded juvenal feathers.

On 17 April 2004, at Warm Beach, Snohomish County, Washington, Barry with Steve Mlodinow observed a flock of roughly 30 Barn Swallows that included two distinctly worn first-cycle birds that stood out from the other, fresh-plumaged individuals. The most evident characters of birds were their washed-out, almost white underparts, tattered rectrices, and frayed primaries; no evidence of molt was apparent.

From 25 March to 16 June 2004, Pike observed and photographed numbers of worn and molting first-cycle Barn Swallows in the Prado Basin, which straddles the borders of Riverside and San Bernardino counties, California. On 25 March, the flock comprised at least 27 birds: 17 worn and molting first-cycle birds and ten nonmolting birds in fresh plumage. On 27 April the bird shown in the upper back cover photo (in Riverside County) had the outer three primaries old, the inner primaries new, and the middle primaries growing. On 27 May (when newly fledged juveniles of the year were also present), two individuals still had the outer 2-3 primaries old and unmolted. On 2 June the bird in the lower back cover photo (in San Bernardino County) had the outermost primary old, the outermost rectrices not fully grown, and active molt on the head. On 16 June, at least one bird still had the outermost primary, as well as the outermost rectrices, growing.

To check for historic evidence of this phenomenon, Howell and Barry examined specimens of Barn Swallows collected in western North America (southern British Columbia and Nevada south to southern California and Arizona). Of 95 specimens collected 25 March to 9 July (not including young of the year), none showed any sign of molt in their flight feathers. None of these specimens was collected in the last 25 years, however, so they predate the recent upsurge of Barn Swallows wintering in the West (Hamilton and Willick 1996, Marshall et al. 2003, Opperman 2003, Patten et al. 2003, Unitt 2004). And the aversion of most collectors to molting passerines should also be considered. Thus, the absence of molting birds in museum collections may offer little evidence for evaluating the extent of delayed molt by first-cycle Barn Swallows.

To the best of our knowledge, the only specific winter records of Barn Swallows molting primaries in North America are of a flock at Mecca, north of the Salton Sea, California, on 31 January 1998 (Patten et al. 2003), and a flock at Kent Ponds, King County, Washington, on 6 February 2005 (Barry pers. obs.) . This latter flock, perhaps involving early spring migrants (cf. Marshall et al. 2003), comprised both adults and first-cycle birds, with both age classes in primary (P) molt. Of about ten adults, most were molting their middle to outer primaries (P5–P9), and one had completed molt; of about 15 first-cycle birds, some had not started molt (and were very worn and faded), but most were molting P1–P3.

Few species molt their flight feathers during midwinter in western North America, and constraints of climate and food supply may cause northerly wintering Barn Swallows to delay their molt. An individual Barn Swallow may take 150–185 days to molt its primaries (Ginn and Melville 1983), so delaying molt probably precludes breeding in the following season; yearlings of both sexes typically breed (Brown and Brown 1999). Thus it is difficult to postulate an evolutionary benefit to northerly wintering by first-cycle Barn Swallows. Perhaps they gain advantages in their second and subsequent breeding seasons?

A less likely explanation for some of the spring-molting Barn Swallows in North America is that they are migrants from a southern-hemisphere breeding population. In 1981, Barn Swallows were first found nesting in Buenos Aires province, Argentina, where they were present from October to April (Martínez 1983). However, that breeding schedule seems unlikely to be responsible for heavily worn and molting first-cycle Barn Swallows in western North America as early as February to April, and we suggest that the occurrence of such birds is linked to the trend of northerly wintering. Conversely, perhaps late-molting first-cycle Barn Swallows from North America migrate in their second winter to South America and at the age of a year and a half are physiologically able to start breeding in the austral summer?

In Europe, Barn Swallows (*H. r. rustica*) undergoing limited body molt during fall migration showed poorer body condition than birds not molting (Pérez-Tris et al. 2001, Rubolini et al. 2002). Those authors interpreted this observation as implying a physiological trade-off between molt and migration, although they did not test how food limitation relates to this scenario (the abundance of aerial insects declines in fall in western Europe). In any case, these European observations relate to molt at a season different from the observations we report from North America.

Simple field observations often generate more questions than answers. To document the trade-off between northerly wintering and molt further, observers seeing wintering Barn Swallows in western North America should note the age and molting status of all birds they see. Additional records of molting individuals during spring and summer would also be of interest, to determine the duration of the delayed molt at different latitudes.

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Back cover “Featured Photos” by © James Pike of Huntington Beach, California: Barn Swallows (*Hirundo rustica*), Riverside County, California, 27 April 2004 (top); San Bernadino County, 2 June 2004 (bottom).

WESTERN BIRDS

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Front cover photo by © Bob Steele of Inyokern, California: Red-necked Stint (*Calidris ruficollis*), China Lake Naval Weapons Station, California, 13 June 2005.

WESTERN BIRDS

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THE 30TH REPORT OF THE CALIFORNIA BIRD RECORDS COMMITTEE: 2004 RECORDS

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ABSTRACT: The California Bird Records Committee reached decisions on 220 records involving 87 species and one species pair reported in 2004, endorsing 161 of them. New to California were the Common Eider (*Somateria mollissima*) and Stonechat (*Saxicola torquatus*). Adjusted for these additions and the species-level merger of the White and Black-backed Wagtails within *Motacilla alba*, California's bird list stands at 629 species, ten of which are nonnative. A potential first state record of the Hawaiian Goose (*Branta sandvicensis*) was not accepted on grounds of questionable natural occurrence, and potential first state records of Parkinson's Petrel (*Procellaria parkinsoni*) and Flame-colored Tanager (*Piranga bidentata*) were not accepted on grounds of identification. Other significant records reported here include the state's second accepted records of the Oriental Turtle-Dove (*Streptopelia orientalis*) and Magnificent Hummingbird (*Eugenes fulgens*), third of the Common Black-Hawk (*Buteogallus anthracinus*) and Red-legged Kittiwake (*Rissa brevirostris*), fifth of the Greater Shearwater (*Puffinus gravis*), fifth and sixth of the Crested Caracara (*Caracara cheriway*), a returning fifth Anhinga (*Anhinga anhinga*), and the sixth Ruby-throated Hummingbird (*Archilochus colubris*). This report also includes an appendix reporting the results of the committee's review of historical records accepted for statistical purposes, previously unpublished committee decisions, and resolution of contentious records from earlier periods.

This 30th report of the California Bird Records Committee (hereafter the CBRC or the committee) details the evaluation of 220 records involving 269 individuals of 87 species and one species pair. Although most records pertain to birds found in 2004, the period covered by this report spans the 109 years from 1896 through 2004. The committee accepted 161 records involving 185 individuals of 66 species and one species pair, for an acceptance rate of 73.2%. Fifty-five records of 80 individuals of 41 species and one species pair were not accepted because of insufficient documentation or because descriptions were inconsistent with known identification criteria. Four additional records of three species were not accepted because of ques-

tions concerning the birds' natural occurrence. Counties best represented by accepted records were San Diego (17 records), Monterey (14), Marin (12), San Francisco (11 records, 10 of them from Southeast Farallon I.), Santa Barbara (11), Los Angeles (9), Imperial (8), Inyo (8), Humboldt (7), and Sonoma (7). Records were also accepted from 20 other counties.

Species recorded in especially high numbers in 2004 included the Yellow-throated Vireo (*Vireo flavifrons*) with eight accepted records, Blue-headed Vireo (*Vireo solitarius*) with seven accepted records, Yellow-throated Warbler (*Dendroica dominica*) with six accepted records, Scarlet Tanager (*Piranga olivacea*) and Snow Bunting (*Plectrophenax nivalis*) with five accepted records each, and American Oystercatcher (*Haematopus palliatus*), Broad-billed Hummingbird (*Cynanthus latirostris*) and White-eyed Vireo (*Vireo griseus*) with four accepted records each.

As a result of the relumping of the White and Black-backed Wagtails (now both *Motacilla alba*) (A.O.U. 2005), the addition of the Common Eider and Stonechat described in this report, and the addition in 2005 of Slaty-backed Gull (*Larus schistisagus*) (to be addressed by the committee's 2005 report), California's list stands at 629 species, ten of which are non-native and two of which have been extirpated within historical times. The committee currently is considering potential first state records of Solander's Petrel (*Pterodroma solandri*), Parkinson's Petrel (*Procellaria parkinsoni*), Ringed Storm-Petrel (*Oceanodroma hornbyi*), and Green Violet-ear (*Colibri thalassinus*).

The acceptance rate of 73.2% is below the weighted average of 79.6% of all the committee's decisions but generally consistent with acceptance rates from the mid-1990s on. (The "weighted average" is the actual ratio of records accepted to records submitted, as opposed to the "unweighted average," the average of the reported acceptance rates of each report regardless of number of species treated per report.) The committee's weighted average acceptance rate has dropped continuously over the past ten reports, with the exception of our 27th (Garrett and Wilson 2003) and 29th (San Miguel and McGrath 2005) reports. The current weighted average is the lowest in the committee's history though only slightly lower than the 79.7% weighted average acceptance rate through the 28th report (Cole and McCaskie 2004). Rottenborn and Morlan (2000) and Cole and McCaskie (2004) discussed trends in acceptance rates though the CBRC's history. The total of 220 records reviewed is slightly above the committee's average of 214.4 records per report over its first 29 reports and brings the average number of records reviewed per report over the committee's 30 reports to 214.6.

The list of species reviewed by the CBRC is posted at the Western Field Ornithologists' web site (http://www.wfo-cbrc.org). This site also includes the entire California state list, the committee's bylaws, a reporting form for the direct e-mail submission of records to the CBRC, the addresses of current committee members, a photo gallery of recent submissions, including pictures of several birds published in this report, and other information about the CBRC, WFO, and its journal, *Western Birds*.

All documentation reviewed by the CBRC, including copies of descriptions, photographs, videotapes, audio recordings, and committee comments, is archived at the Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, California 93012, and is available for public review.

The CBRC solicits and encourages observers to submit documentation for all species on the review list, as well as species unrecorded in California. Documentation should be sent to Guy McCaskie, CBRC Secretary, P. O. Box 275, Imperial Beach, CA 91933-0275 (e-mail: guymcc@pacbell.net).

Since its establishment in 1970 the committee has tried to identify and evaluate pre-1970 records of species on the review list. In 2004 the committee voted on >100 such records for which no documentation was extant and statistically accepted a number of them from two categories: those based on publication in ornithological journals, with specimens not now available (lost in the 1906 San Francisco earthquake and fire, for example), and records of a species in years before, between, or after accepted records of that same individual. The committee's review of the records reported in the appendix, Evaluation of Historical and Unreviewed Records, differed from its normal review in that none of the records was accompanied by documentation; their evaluation instead represents the committee's policies toward categories of records. The appendix also includes some previously unpublished decisions on statistically accepted records, as well as decisions resolving several contentious records from earlier periods.

NEWS AND FORMAT

Committee News. The committee's voting membership after the January 2006 annual meeting consisted of Dave Compton, Jon L. Dunn, Kimball L. Garrett, Matthew T. Heindel (chair), Marshall J. Iliff, Alvaro Jaramillo, Joseph Morlan, Daniel S. Singer (vice chair), and Scott B. Terrill. Guy McCaskie continued in his role as nonvoting secretary. Recent committee members who also voted on many of the records in this report include Luke W. Cole, Todd McGrath, Kristie N. Nelson, Peter Pyle, Michael M. Rogers, Mike San Miguel, and John C. Sterling.

Format and Abbreviations. As in other recent CBRC reports, records are generally listed chronologically by first date of occurrence and/or geographically, from north to south. Included with each record is the location, county abbreviation (see below), and date span. The date span usually follows that published in *North American Birds* (formerly *American Birds* and *Field Notes*), but if the CBRC accepts a date span that differs from a published source, the differing dates are italicized. Initials of the observer(s) responsible for finding and/or identifying the bird(s)—if known and if they supplied supportive documentation—are followed by a semicolon, then the initials, in alphabetized order by surname, of additional observers submitting supportive documentation, then the CBRC record number consisting of the year of submission and a chronological number assigned by the secretary. All records are sight records unless otherwise indicated: initials followed by a dagger (†) indicate the observer supplied a supportive photograph, (‡) indicates videotape, and (#) indicates a specimen record, followed by the acronym (see below) of the institution housing the specimen and that institution's specimen catalog number. An asterisk (*) prior to a species' name indicates that the species is no longer on the CBRC's review list.

During 2003, in preparation for the publication of *Rare Birds of California*, the committee changed the way it reports records and individuals,

a change in the committee's tradition bringing its reporting into conformity with its bylaws. In this report, the first number in parentheses after the species' name is the number of *individual birds* accepted by the CBRC through this report, not the number of accepted *records*; the number of individual birds may be higher than the number of records as historically the committee has treated groups of individuals appearing together with a single record number (e.g., a flock of Common Redpolls, *Carduelis flammea*). The second number is the number of new individuals accepted in this report (because this number excludes records thought to pertain to returning individuals treated in previous reports, it may be zero). Two asterisks (**) after the species' total indicate that the number of accepted records refers to a restricted review period only or includes records accepted for statistical purposes only; see Roberson (1986) for more information.

When individual birds return to a location after a lengthy or seasonal absence, each occurrence is reviewed under a separate record number, and committee members indicate whether or not they believe the bird is the same as one accepted previously. Such decisions follow the opinion of the majority of members, and, if a bird is considered a returning individual, the total number of individuals remains unchanged.

Although the CBRC does not formally review the age, sex, or subspecies of each bird, information on these subjects is often provided during the review process (and in some cases a strong majority or consensus is achieved). We report much of this information; the diagnosis of age, sex or subspecies is the authors' opinion based on the evidence in the files and committee members' comments. Our terminology for age follows the calendar-based terminology devised by the U.S.G.S. Bird Banding Laboratory and detailed by Pyle (1997). We prefer a calendar-based system because other age-coding systems, including those based on Humphrey and Parkes' (1959) plumage terminology, become imprecise during periods of transition or molt, in North America most frequently in the summer and early fall. In the accounts we use the terms "juvenile" (restricted to a bird in *complete* juvenal plumage), "first-fall," "first-spring," and "first-year" to designate birds less than a year old, "second-fall," etc., for birds between one and two years old, "third-fall," etc., for birds between two and three years old, and "adult" for birds in definitive plumage that may be at least one, two, three, or four years old depending on the species. To avoid ambiguity we use the terms "one-year-old," "two-year-old," etc., in lieu of "first-summer," "second-summer," etc., for birds observed in June through August. We also sometimes use age/plumage terms based on Humphrey and Parkes' (1959) terminology (e.g., "first alternate plumage") when both the age and the plumage state are known and are important information regarding the record.

The CBRC uses standard abbreviations for California counties; those used in this report are ALA, Alameda; CC, Contra Costa; DN, Del Norte; ED, El Dorado; HUM, Humboldt; IMP, Imperial; INY, Inyo; KER, Kern; LAS, Lassen; LA, Los Angeles; MRN, Marin; MEN, Mendocino; MNO, Mono; MTY, Monterey; ORA, Orange; PLA, Placer; PLU, Plumas; RIV, Riverside; SAC, Sacramento; SBE, San Bernardino; SD, San Diego; SF, San Francisco; SJ, San Joaquin; SLO, San Luis Obispo; SM, San Mateo; SBA, Santa Barbara; SCL, Santa Clara; SCZ, Santa Cruz; SHA, Shasta;

SIS, Siskiyou; SON, Sonoma; SUT, Sutter; TUL, Tulare; TUO, Tuolumne; VEN, Ventura. A list of county abbreviations for all 58 California counties is available on the WFO–CBRC web site and in Langham (1991). Other abbreviations used: Cr., creek; I., island; L., lake; Mt., mountain; n. miles, nautical miles; N.W.R., national wildlife refuge; Pt., point; R., river; W.A., wildlife area; W.M.A., wildlife management area.

Museum collections housing specimens cited in this report, allowing access to committee members for research, or otherwise cited, are the California Academy of Sciences, San Francisco (CAS); Conner Museum, Washington State University, Pullman (CM-WSU); Museum of Vertebrate Zoology, University of California, Berkeley (MVZ); Natural History Museum of Los Angeles County, Los Angeles (LACM); Harvard University's Museum of Comparative Zoology, Cambridge, Massachusetts (MCZ); Pacific Grove Museum of Natural History (PGMNH); San Bernardino County Museum, Redlands (SBCM); and the National Museum of Natural History at the Smithsonian Institution, Washington, D.C. (USNM).

RECORDS ACCEPTED

TRUMPETER SWAN *Cygnus buccinator* (61, 2). Two adults were at the Lower Klamath N.W.R., SIS, 28 Nov 2004 (MB; DVP; 2004-203).

KING EIDER *Somateria spectabilis* (37, 1). An immature female was shot by a hunter in south Humboldt Bay, HUM, 26 Nov 2004 (JrT#; JfT†; 2004-212). The specimen was kept for a personal collection.

COMMON EIDER *Somateria mollissima* (1, 1). An adult male was near shore off Crescent City, DN, 5–18 Jul 2004 (CEV†; MJB, MWE†, RFo, PAG, CL, LML, RLeV†, MJM, CAM, GMcC, JMo†, MMR, KeR†, MSanM†, DSS†; 2004-101), establishing the first record for California. The bird was of the Alaskan subspecies *v-nigrum* because of its bright orange bill and black "V" on the chin (Goudie et al. 2000). Its occurrence in July was wholly unexpected, so its identification as the "expected" Alaskan subspecies lends credence to the idea that the bird was a naturally occurring vagrant. With only three previous records of the Common Eider for coastal British Columbia, including one from mid-May, and none from Oregon or Washington, this record was extraordinary. Interestingly, Washington's first accepted Common Eider, a molting adult male *v-nigrum*, was at Port Angeles 3–13 Aug 2004 (Wahl et al. 2005); Mlodinow et al. (2004) speculated that it might be the same individual as the California bird. By contrast, most records elsewhere in the West (88%) are from large inland lakes in late fall or early winter in the Canadian prairie provinces and Great Plains states (Mlodinow 1999). McCaskie and Vaughn (2004) provided further details of the California occurrence.

YELLOW-BILLED LOON *Gavia adamsii* (74, 3). A specimen in Harvard University's Museum of Comparative Zoology, a first-winter bird collected in Monterey, MTY, 24 Dec 1896 (JTr†; #MCZ 246938; 2005-043), provides the earliest record for California. A first-fall bird at Eagle L., LAS, 8 Oct 2004 (KPA†; 2004-158) was a first for the county and the state's earliest in fall by two days. One was at Elkhorn Slough, MTY, 15 Apr–17 May 2004 (GH†; MB, DR†; 2004-059). See also Records Not Accepted, identification not established.

MOTTLED PETREL *Pterodroma inexpectata* (55, 1). A male was picked up sick at an auto mall in Seaside, MTY, 24 Nov 1996 (ABa; SB, DHa, DR; #PGMNH 2279A; 2005-050). The bird died in captivity the following day and was prepared and stored as a specimen at the Pacific Grove Museum of Natural History.

GALAPAGOS/HAWAIIAN PETREL *Pterodroma phaeopygia/sandwichensis* (14, 1). One was seen 15 miles sw. of Bodega Head, SON, 17 Sep 2004 (SNGH; JLD, DVP; 2004-154). The Galapagos and Hawaiian Petrels were formerly considered conspecific as the Dark-rumped Petrel (*P. phaeopygia*) but have recently been reclassified as two species on the basis of differences in vocalizations, morphology, and genetics (Browne et al. 1997, Banks et al. 2002). Accurate field identification of these species has not yet been demonstrated or tested. Preliminary discussions of potential field marks based on morphological and other differences have been published, however (Tomkins and Milne 1991, Simons and Hodges 1998, Roberson 2001). See also Records Not Accepted, identification not established.

STREAKED SHEARWATER *Calonectris leucomelas* (12, 1). One was photographed 15 miles sw. of Bodega Head, SON, 17 Sep 2004 (SNGH; JLD, DVP, RZ†; 2004-148; Figure 1). See also Records Not Accepted, identification not established.

GREATER SHEARWATER *Puffinus gravis* (5, 1). One was photographed 7.7 miles wsw. of Bodega Head, SON, 29 Aug 2004 (RS†, LH; RLeB†, CL‡, MM†, DMcK†, EPr†, RR; 2004-129; Figure 2). See also Records Not Accepted, identification not established.

MANX SHEARWATER *Puffinus puffinus* (82, 5). One was seen from shore off Southeast Farallon I., SF, 14 Sep 1997 (GP; 2004-189). One was 16 miles offshore of Oceanside, SD, 28 Apr 2004 (TMcG; 2004-097). One was seen from shore at Pt. Piedras Blancas, SLO, 27 May 2001 (RAR; 2002-007). Another was 22 miles w. of Yankee Pt., MTY, 22 Aug 2004 (DR†; JPo†, EPr†, DSS; 2004-126). One seen from shore off Pt. Sur, MTY, 19 Dec 2004 (DR; 2004-217) was outside of the seasonal range of most central and northern California records but was not unprecedented. See also Records Not Accepted, identification not established.

MASKED BOOBY *Sula dactylatra* (12, 0). An adult at China Pt. on San Clemente I., LA, 13 Jul–15 Aug 2004 (BLS†; 2004-165) was considered a returning individual that had been at the same location 17 Jan–29 Mar 2003 (2003-065) and 10 Aug–8 Oct 2003 (2003-128) (San Miguel and McGrath 2005).

BROWN BOOBY *Sula leucogaster* (81, 1). One in its second fall was 9 miles ene. of Southeast Farallon I., SF, 1 Nov 2004 (PP†; 2004-183). See also Records Not Accepted, identification not established.

ANHINGA *Anhinga anhinga* (5, 0). An adult male at Finney/Ramer lakes, IMP, 19 Mar–6 May 2004 (HDD†; GMcC, MMR†; 2004-045) was considered to be the same bird present there 5 Apr–12 Jun 2003 (2003-035; San Miguel and McGrath 2005).

TRICOLORED HERON *Egretta tricolor* (43**, 1). One was at Upper Newport Bay and Seal Beach, ORA, 21 Dec 2003–19 Mar 2004 (JFi, TA†; 2003-200). See also Records Not Accepted, identification not established.

GLOSSY IBIS *Plegadis falcinellus* (6, 1). One at Sutter N.W.R., SUT, 29 May 2004 (MP†; 2004-093; Figure 3) was the first recorded in the Central Valley and only the second for northern California, with the first being in Santa Clara and Alameda counties in 2001 (Garrett and Wilson 2003). The Sutter bird was photographed at the edge of a colony of thousands of White-faced Ibises, raising concern over potential hybridization. See also Records Not Accepted, identification not established.

ROSEATE SPOONBILL *Platalea ajaja* (17**, 2). One observed near San Bernardino, SBE, 20 Jun 1903 (RBH; 2004-301) provided the earliest documented record for California (Stephens 1904). A second-winter bird first discovered at Fig Lagoon, IMP, moved to the Highline Canal east of Brawley, then to the south end of

the Salton Sea 5 Jan–13 Apr 2004 (RFo†; REM, JEG†, KZK†, BM†, CAM, GMcC, DN, MMR; 2004-010). This spoonbill is the first recorded in California since one was at Fig Lagoon 27–30 Dec 1994 (Howell and Pyle 1997).

COMMON BLACK-HAWK *Buteogallis anthracinus* (3, 1). One at L. Lincoln in suburban Stockton, SJ, 24 Feb–12 Mar 2004 (VS†; 2004-113) provided the first record for northern California and the first winter record for the state. This bird returned and was seen well and photographed by many from 1 Oct 2004 to 21 Mar 2005 (VS; LWC†, HC†, SC†, TE†, SG†, MJM, JM†, DR, MMR†, DY; 2005-014; cover of *Western Birds* 36(4); Figure 4). A record from Sonoma County in spring/summer 2005 is currently under review by the committee. The previous records for California were from the Coachella Valley 13 Apr 1985 (Roberson 1986) and 28 Mar–2 May 1997 (Rottenborn and Morlan 2000), closer to the species' normal range.

HARRIS'S HAWK *Parabuteo unicinctus* (46**, 3). Up to five resident, with nesting in 2000, 2001 and 2002, in McCain Valley north of Boulevard, SD, 1 Jun 2000–23 Feb 2003 (PU; PG, GMc, TM†, MMR†; 2000-098), and up to two resident around Borrego Springs, SD, 11 Jan 2000–11 Feb 2002 (PJ; RAH; 2000-068) are considered to be some of those present from 1 June 1994 and 15 April 1994, respectively (1996-080B and 1996-080A; Erickson and Hamilton 2001), with the history of these birds detailed more fully by Unitt (2004). One at Spring Valley, SD, 24 Apr 2001 (MAP; 2001-108) and another at Fig Lagoon, IMP, 27 Mar 2004 (BLS†; 2004-056) were probably vagrants from Baja California. A hatch-year male was collected at San Diego, SD, 6 Nov 1896 (JTr†; #MCZ 150018; 2005-044); this record was not listed by Grinnell and Miller (1944) or Unitt (2004) and is the first for San Diego County. See also Records Not Accepted, natural occurrence questionable.

*ZONE-TAILED HAWK *Buteo albonotatus* (68, 1). A specimen at Harvard University's Museum of Comparative Zoology was collected at San Diego, SD, 26 Nov 1906 (JTr†; #MCZ 316491; 2005-045) and established the second earliest record for California. The committee reviews reports of the Zone-tailed Hawk through 1998 only.

CRESTED CARACARA *Caracara cheriway* (6, 2). One was at Cottonwood Marsh on the west shore of Owens Lake, INY, 9 May 2004 (REM Jr; 2004-074). A two-year-old bird on a private ranch 10.5 miles west of Petaluma, SON, 16 Jul–1 Aug 2004 (RR; LML, AW†; 2004-118) was considered to be the same individual found at Manchester S. P., MEN, 20–24 Aug 2004 (AAM; GC, RFt†, RJK†, KPe; 2004-124) and at the Jacoby Creek mouth near Arcata, HUM, 4–6 Sep 2004 (RLeV†; KeR†; 2004-133). The committee, after considerable deliberation, concluded in 2004 that the recent spate of Crested Caracara records more likely involved birds of natural occurrence (San Miguel and McGrath 2005). See also Records Not Accepted, identification not established.

AMERICAN GOLDEN-PLOVER *Pluvialis dominica* (4**, 4). In 2004, the committee added this species to the CBRC review list on the basis of a general perception that it may be rarer in California than reports indicate (Cole and McCaskie 2004). Therefore the committee solicits documentation of reports after 1 Jan 2004 to evaluate the species' status in the state and to determine whether a more permanent placement on the review list is warranted.

Four well-photographed juveniles were reported. Two were at Abbott's Lagoon, MRN, the first 6–16 Sep 2004 (SNGH†; RHa†, KCK, MJM; 2004-135), the second, overlapping with the stay of the first, 15 Sep 2004 (SNGH†; 2004-138). The others were at Bodega Harbor, SON, 6 Sep 2004 (AW†; 2004-210) and La Jolla, SD, 2–21 Oct 2004 (LAC†; 2004-211).

AMERICAN OYSTERCATCHER *Haematopus palliatus* (29, 5). One was at Royal Palms State Beach, LA, 14 Mar 2003 (RB†; 2003-033); another was at La Jolla,

SD, 16 Mar 2004 (SES; 2004-050); a third was at the Nature Conservancy landing on Santa Cruz I., SBA, 3 Apr–5 Jul 2004 (SW†; JMu†; 2004-058); a fourth was on Anacapa I., VEN, 6 Jun 2004 (JFe†; 2004-116); a fifth flew past Newport Beach, ORA, 17 Aug 2004 (MJI; 2004-128). These were all at locations with suitable habitat and within the species' established range of vagrancy in California. Jehl (1985) set forth an index for identifying hybrid American × Black (*H. bachmani*) oystercatchers, quite useful as many apparent American Oystercatchers in California show intermediate characteristics. See also Records Not Accepted, identification not established.

HUDSONIAN GODWIT *Limosa haemastica* (23, 2). A juvenile was at Abbott's Lagoon, MRN, 8 Aug 2004 (DDiT†; 2004-123; Figure 5), and a juvenile with different plumage was at the same location 2–8 Sep 2004 (SNGH†; LML; 2004-155).

BAR-TAILED GODWIT *Limosa lapponica* (29, 1). One in its first fall was at Cock Robin I. in the Eel R. estuary, HUM, 5–15 Oct 2004 (SMcA†; 2004-159; Figure 6). See also Records Not Accepted, identification not established.

CURLEW SANDPIPER *Calidris ferruginea* (34, 2). One in its first fall was at Bolinas Lagoon, MRN, 15–20 Sep 1999 (MO'B; SNGH; KCK, CP; 1999-154A). This record was originally not accepted (1999-154; Rogers and Jaramillo 2002) but was recirculated after additional observers submitted documentation, leading to ultimate acceptance. One molting from first-winter into first-summer plumage was at Red Hill at the south end of the Salton Sea, IMP, 9 Apr 2004 (JLD, GMcC; KZK†; 2004-053).

*BUFF-BREASTED SANDPIPER *Tryngites subruficollis* (128**, 1). One was on Santa Barbara I., SBA, 27 Aug 1985 (PWC; 2005-046). The committee reviews Buff-breasted Sandpiper records through 1991 only.

LITTLE GULL *Larus minutus* (89, 3). An adult at L. Perris, RIV, 18 Feb–5 Mar 2004 (HBK; MJI, GMcC; 2004-035) was considered to be the same bird returning 12 Nov 2004–24 Feb 2005 (CMcG†; GHg, HBK; 2004-193); this bird first wintered at L. Perris 28 Jan–15 Mar 2001 (2001-034; Garrett and Wilson 2003). One in its first winter was at Fairmont Park, RIV, 24 Dec 2004 (CTL†; 2004-221). A one-year-old bird at Pescadero Cr., SM, 8 Jun–6 Jul 2004 (MH; MWE†, RFi, JM†, SBT; 2004-088) provided a third county record. One in its first fall at Crowley L., MNO, 27 Aug 2004 (JLD; DHo†; 2004-125) provided a second county record.

BLACK-HEADED GULL *Larus ridibundus* (23, 1). An adult in Alviso, SCL, 6 Apr 2004 (BR; MMR; 2004-055) was the second for its county.

LESSER BLACK-BACKED GULL *Larus fuscus* (25, 2). An adult was at Alviso, SCL, 31 Oct 2004 (DVP, MB; MMR†; 2004-194), and another adult with duller legs was at the same location 31 Oct–7 Nov 2004 (DVP, MB; MMR†; 2004-195). See also Records Not Accepted, identification not established.

RED-LEGGED KITTIWAKE *Rissa brevirostris* (3, 1). One at the Klamath R. mouth, DN, 9 Mar 2003 (RFo; BMcD; 2003-027) took four rounds to be accepted. The bird was in a flock of 20 to 30 Black-legged Kittiwakes (*R. tridactyla*) roosting on shore during a storm but could not be relocated on subsequent days after the roosting kittiwake flock had dispersed. This Red-legged Kittiwake was only California's third, following one in Anaheim, ORA, 28 Feb 1996 (McCaskie and San Miguel 1999) and another in Ross, MRN, 13 Feb 2001 (Garrett and Wilson 2003) that were both found emaciated on shore close to the coast and died soon after their discovery. All three California records fit the timing of peak vagrancy to Oregon (7 records 30 Dec–25 Mar, all of birds dead or dying on the beach, and one offshore 7 Aug 1983; Marshall et al. 2003) and Washington (4 records 1 Dec–21 Mar; 2 records 28 Jun–19 Aug; Wahl et al. 2005). One additional record from the western U.S. is exceptional: one found at Corn Cr., Nevada, 3 Jul 1977 (Roberson 1980).

Figure 1. This Streaked Shearwater (*Calonectris leucomelas*) was 15 miles off Bodega Head, Sonoma County, 17 September 2004.

Photo by Robert Zaremba

Figure 2. Only the fifth recorded in California waters, this Greater Shearwater (*Puffinus gravis*) was just 8 miles from Bodega Head, Sonoma County, on 29 August 2004.

Photo by Eric W. Preston

Figure 3. This first Glossy Ibis (*Plegadis falcinellus*) recorded in the San Joaquin Valley was photographed 29 May 2004 at Sutter N.W.R., Sutter County.

Photo by Michael Peters

THICK-BILLED MURRE *Uria lomvia* (45, 1). One off Pt. St. George, DN, 14 Sep 2002 (BMcK; TE†; 2002-184) furnished a first county record. This record was controversial, with some disagreement among observers over the bird's identity. Photographs and a written description, however, supported the identification as a Thick-billed Murre, although the record took four rounds to gain acceptance.

LONG-BILLED MURRELET *Brachyramphus perdix* (17, 3). One was seen from

Figure 4. This Common Black-Hawk (*Buteogallus anthracinus*), northern California's first and just the third for California, returned for a second winter to Lake Lincoln, Stockton, San Joaquin County, photographed here 30 January 2005.

Photo by Todd Easterla

Figure 5. This juvenile Hudsonian Godwit (*Limosa haemastica*) was at Abbott's Lagoon, Marin County, 8 August 2004.

Photo by Dean DiTommaso

shore off MacKerricher S. P., MEN, 20–27 Oct 2003 (DT; GC, AM, CEV, JW; 2004-004). Two were seen during nearshore surveys for the Marbled Murrelet (*B. marmoratus*) off Salmon Cr. Beach, SON, 7 Jul 2004 (RST†; 2004-102). This summer record raised speculation that the species might breed in North America.

ORIENTAL TURTLE-DOVE *Streptopelia orientalis* (2, 1). One at Furnace Cr.

Figure 6. This juvenile Bar-tailed Godwit (*Limosa lapponica*) was with a Marbled Godwit (*L. fedoa*) at the mouth of the Eel River, Humboldt County, 6 October 2004.

Photo by Sean McAllister

Figure 7. Although the pale basal half of the mandible seen in this bird suggests the Streaked Flycatcher (*Myiodynastes maculatus*), bill coloration is not a definitive field mark. The broad, blackish malar, dark chin, and other plumage features confirm this bird's identification instead as a Sulphur-bellied Flycatcher (*M. luteiventris*), photographed 1 October 2004 at Southeast Farallon I., San Francisco County.

Photo by Adam Brown

Figure 8. This Sedge Wren (*Cistothorus platensis*) was observed 13 October 2004 at the Goleta sewage ponds in Goleta, Santa Barbara County. The pale, streaked cap and indistinct supercilium help distinguish this bird from the Marsh Wren (*C. palustris*).

Photo by Wes Fritz

Figure 9. This Veery (*Catharus fuscescens*) was mist-netted and banded 19 June 2004 on lower Rush Creek, Mono County. Note the grayish-white flanks, pale spotting limited to the upper breast, brownish lores and lack of an eyering.

Photo by Kelly Grady

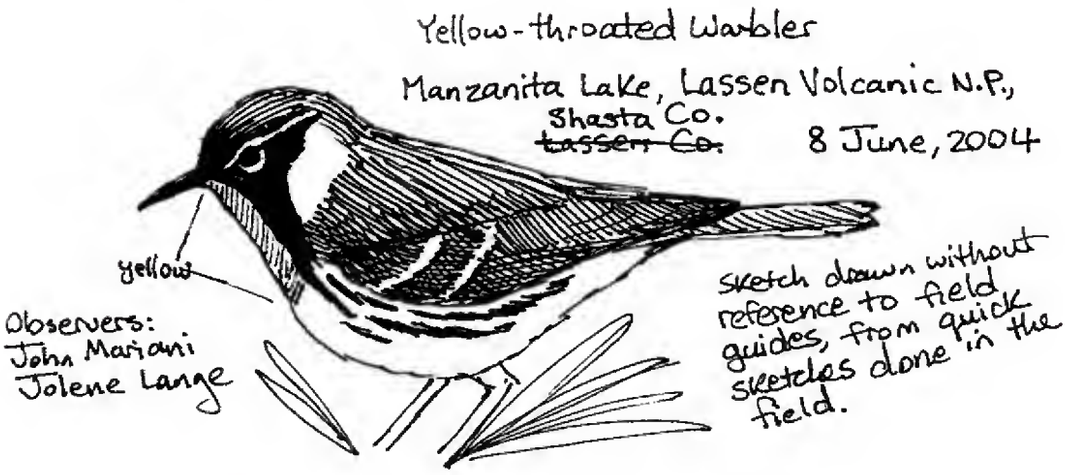

Figure 10. This Yellow-throated Warbler (*Dendroica dominica*) was observed 8 June 2004 at Manzanita Lake in Lassen Volcanic National Park, Shasta County.

Sketch by John Mariani

Figure 11. This male Grace's Warbler (*Dendroica graciae*) was photographed 13 June 2004 at the Chimney Creek Recreation Area campground, Tulare County.

Photo by Larry Sansone

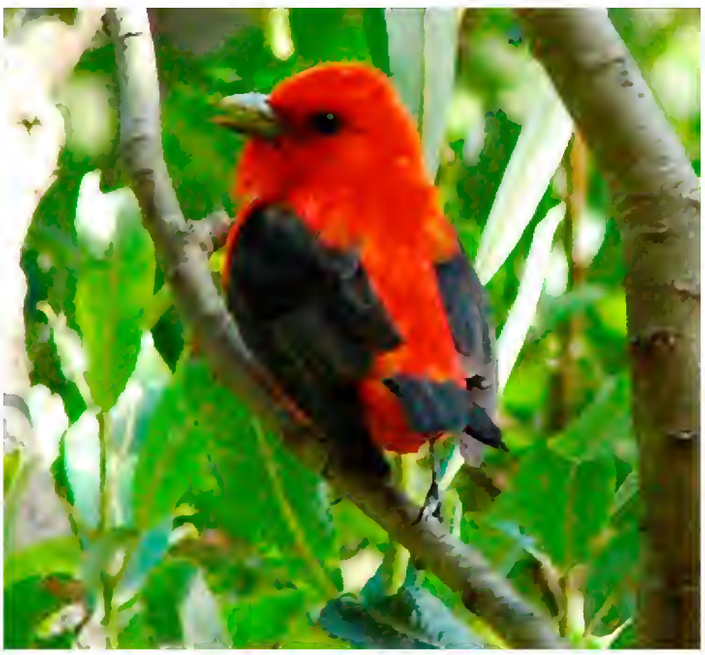

Figure 12. This male Scarlet Tanager (*Piranga olivacea*) was enjoyed by observers 11 June 2004 at San Bruno Mountain State and County Park, San Mateo County. Note the fresher, blacker adult wing coverts contrasting with the older, worn and grayish remiges, indicating this bird was one year old.

Photo by Zane Terry

Ranch in Death Valley National Park, INY, 29 Oct 1988 (JLD; 1988-246A) was the first reported for California and was accepted following acceptance of the record from Bolinas, MRN, 9–31 Dec 2002 (San Miguel and McGrath 2005). The 1988 record had been reviewed by the committee previously but not accepted because three members considered the documentation insufficient for a first state record and four others thought that the bird may not have been wild (1988-246; Heindel and Garrett 1995). The record was resubmitted in light of the acceptance of the Bolinas bird and the view of committee members that wild vagrant Oriental Turtle-Doves could reach California. It was accepted in the first round of voting, although one committee member thought that there was enough doubt about natural occurrence to vote to not accept and another member thought that the documentation was insufficient to rule out the European Turtle-Dove (*S. turtur*) beyond a reasonable doubt. Because one of the two votes not to accept the record was based upon questionable natural occurrence, the vote of eight to two was sufficient for the record to be accepted.

BROAD-BILLED HUMMINGBIRD *Cynanthus latirostris* (64, 3). An adult male in Sonoma, SON, 26 May–9 Jun 2004 (KPa†; 20004-105) was considered to be a returning bird, previously present 14–27 Nov 2003 (2003-162; San Miguel and McGrath 2005). The appearance of this bird during May and June marks California's first record of the Broad-billed Hummingbird during these two months. The only previous accepted spring record was of one at Short Canyon, KER, 18 Apr 1982 (Morlan 1985). Another adult male in Novato, MRN, 24–26 Sep 2004 (DF†; 2004-164) was the first recorded in this intensely birded northern county. One in Arroyo Grande, SLO, 2–12 Nov 2004 (TME; WAB†; 2004-214) was only the second recorded in its county. A first-fall male coming to a feeder in Dana Pt., ORA, 20–22 Oct 2004 (MD†; 2004-187) was in southern California where the species' occurrence is more expected.

MAGNIFICENT HUMMINGBIRD *Eugenes fulgens* (2, 1). A female was in Eureka, HUM, 8 Apr–17 May and 21 Jun 2004 (ABo†, CAM, DQ, KeR†, RST†; 2004-054). California's only previous record was during the previous fall, 11 Oct–29 Nov on the far southern coast in Pacific Beach, San Diego, SD (San Miguel and McGrath 2005). This species is well known to wander north in the Rocky Mountain and intermountain regions and occasionally to the Southeast and upper Midwest (Howell 2002); it had been expected to occur in southern California. One in a coniferous forest several miles inland on the north coast, however, was unexpected.

RUBY-THROATED HUMMINGBIRD *Archilochus colubris* (6, 1). One was captured and photographed on Southeast Farallon I., SF, 12 Sep 1986 (SNGH†; 1987-005A). It had previously been not accepted (Roberson 1993) but was resubmitted and passed on the third round of voting. This record was controversial because of the poor quality of photographs and the lack of a specimen, but recent advances in identification (e.g., Pyle 1997 and Howell 2002) allowed the committee to review the extant evidence and endorse the identification.

YELLOW-BELLIED FLYCATCHER *Empidonax flaviventris* (18, 3). A well-documented vocalizing bird at the headquarters of the Wister Unit of the Imperial W.A. near Niland, IMP, 3–5 Sep. 2004 (MSanM Jr.; KZK†, CAM, GMcC, MSanM, SBT, DVP‡; 2004-130) tied the earliest date for California and provided a first for Imperial County. Another in Pacific Grove, MTY, 21 Sep 2004 (DR†; MB, DVP‡; 2004-146) gave calls typical of a migrant and established the first record for Monterey County. After circulating four rounds, a record of one at California City, KER, 5 Oct 2002 (TE, AH, VH, AEK; 2002-170) became the first nonphotographed silent Yellow-bellied Flycatcher to be accepted by the committee, on a 9–1 vote. The dissenting member was strongly opposed to accepting the record because of the difficulty of identifying silent vagrants of *Empidonax* and unease with relying on written documentation

only. The descriptions were consistent, however, and all observers were careful in eliminating the Western Flycatcher (*E. difficilis/E. occidentalis*), of which one was present for comparison.

SULPHUR-BELLIED FLYCATCHER *Myiodynastes luteiventris* (15, 1). One in its first fall at Southeast Farallon I., SF, 1 Oct 2004 was the first for that locale (KNN†; ABr†, JTz; 2004-178; Figure 7). All California records of this species have been from the immediate coast, and, except for a single spring record, fall between 13 Sep and 20 Oct.

WHITE-EYED VIREO *Vireo griseus* (52, 5). One was at Vandenberg Air Force Base, SBA, 8–12 Jun 2000 (JGa; 2005-006). Others were at Tassajara Regional Park, ALA, 20–23 May 2004 (LWC, JMo, DQ; 2004-070), the Big Sur R. mouth, MTY, 3–13 Jun 2004 (RFo; SBT, DVP; 2004-106), and Big Basin Redwood State Park, SCZ, 15 Jun 2004 (DLS; 2004-121). Another was banded near Bradley, MTY, 22 Jun 2004 (JGr, EM†; 2004-104). Consistent with the majority of California's records, all were spring migrants, and except for the bird at Bradley, which was mist-netted, all were singing males.

YELLOW-THROATED VIREO *Vireo flavifrons* (103, 8). Seven of the eight 2004 records involved singing males. Single individuals were at Fort Piute, SBE, 16 May 2004 (AH, AEK; 2004-066), Butterbredt Spring, KER, 29–31 May 2004 (RFi, CAM, GMcC, JMo, SBT; 2004-076), Harbor City, LA, 31 May 2004 (KGL; 2004-087), Vandenberg Village, SBA, 4–5 Jul 2004 (DC, WF†; 2004-122), and Mono Lake County Park, MNO, 8 Jun 2004 (DHo; 2004-110). Two were at the Big Sur R. mouth, MTY: one 20–24 May 2004 (DR†, DVP; 2004-075), the other 3–13 Jun 2004 (RFo; SBT; 2004-085). The only nonsinging Yellow-throated Vireo for 2004 was at Palm City, SD, 21–22 Jun 2004 (GLR; MJB, GMcC; 2004-095).

BLUE-HEADED VIREO *Vireo solitarius* (41, 8). A record from Southeast Farallon I., SF, 5 Oct 2001 (RDB†; 2002-015) received less than full support in its first three rounds primarily because of the poor quality of prints of digital images; the record was accepted when better-quality prints were circulated. One was seen briefly by an experienced observer on the unprecedented date of 20 Apr 2004 at Butterbredt Spring, KER (PEL; 2004-064), among a migrating wave of Cassin's Vireos (*V. cassinii*), with which it may have wintered. The record convinced nine members by its second round, becoming only the second accepted spring Blue-headed Vireo for California. The first was a well-documented singing male at Huntington Beach, ORA, 13 May 2000 (McKee and Erickson 2002). The Blue-headed Vireo migrates early, and late April is near the end of its normal migration at the latitude of southern California (Alderfer 2005); interestingly, there are no spring reports but over 30 fall reports from Southeast Farallon I. (P. Pyle, pers. comm.).

Another early migrant, this one in fall, was at Fort Rosecrans National Cemetery, SD, 17 Sep 2004 (MTH; GMcC; 2004-144). California's earliest in fall was at Southeast Farallon I., SF, 9–13 Sep 1995 (San Miguel and McGrath 2005). In the East the Blue-headed Vireo migrates relatively late, and the majority of California's records are from late September through late October. More typical dates were those of Blue-headed Vireos at Toyon Bay, Santa Catalina I., LA, 28 Sep 2004 (DGo; 2004-184, the first to be accepted from that county), Mendoza Ranch, MRN, 1–2 Oct 2004 (LCh†, RFi, JMo; 2004-149), and Neary Lagoon, Santa Cruz, SCZ, 1 Oct 2004 (SG; 2004-185). Two were at Southeast Farallon I., SF, in 2004: 30 Sep (JT; ABr, KNN†; 2004-179) and 5 Oct (KNN; 2004-180). See also Records Not Accepted, identification not established.

YELLOW-GREEN VIREO *Vireo flavoviridis* (85, 3). One at Cabrillo National Monument, Pt. Loma, SD, 15 Sep 2004 was early (RoB; SBM; 2004-141); there are only four California records earlier in the fall. Others were at the Goleta Sewage

Ponds, SBA, 11 Oct 2004 (NL; DC, WF; 2004-161) and Nunes Ranch, Pt. Reyes, MRN, 22 Oct 2004 (SBT; DN†; 2004-170). See also Records Not Accepted, identification not established.

BLUE JAY *Cyanocitta cristata* (12,1). One near Weed, SIS, 8 Nov 2004 provided a first county record (GF, NEC†; 2004-197).

SEDGE WREN *Cistothorus platensis* (8,1). A calling Sedge Wren photographed at the Goleta sewage ponds, SBA, 13 Oct 2004 was the earliest accepted for California by two days (NL; DC, WF†, MAH†, CAM; 2004-162; Figure 8).

DUSKY WARBLER *Phylloscopus fuscatus* (10,1). One in its first fall, captured, photographed, and banded 2 Oct 2004 at the Big Sur Ornithology Lab, Andrew Molera State Park, MTY, was exhausted and died shortly after being released (JGr†; #CAS 92944; 2004-150). Similar species of the notoriously difficult Old World genus *Phylloscopus*, such as Radde's Warbler (*P. schwarzi*) and the Yellow-streaked Warbler (*P. armandii*), were eliminated by a combination of this bird's eyeline (darker, extending to bill), supercilium (thinner in the Dusky; often with a darker border above and below in Radde's and the Yellow-streaked), bill (thinner and darker in the Dusky), and overall brownish coloration. See Bradshaw (1994), Baker (1997), and Madge (1990) for further information on identification within this complex.

STONECHAT *Saxicola torquatus* (1, 1). This unexpected bird, seen on San Clemente I., LA, 20–21 Oct 1995, was initially identified as a Vermilion Flycatcher (*Pyrocephalus rubinus*) (RTP†; 2005-005). Years later, Brian L. Sullivan, while writing a summary of the birds of San Clemente I. (Sullivan et al. 2005), requested the documentation from Patton, as this record would have predated the single record of the Vermilion Flycatcher for the island. The photos and supporting field notes, which fortunately had been saved, proved the bird to be a Stonechat, a first record for lower North America. Plumage features, posture, and structure helped identify the bird as likely an individual of the Siberian *maura* group of subspecies, either *S. t. maura* or *S. t. stejnegeri*. Unlike this bird, the similar Whinchat (*S. rubetra*) has a much bolder supercilium and bold streaking on the upperparts. The brief written description was helpful by mentioning a pale rump (the rump is streaked in the Whinchat) and the bird's behavior of constant tail-fanning and wing-flicking (the Whinchat is more sedate). In North America, the Stonechat is previously known from just eight records in western Alaska (Sullivan et al. 2005) and a single remarkable record of *maura* or *stejnegeri* at Grand Manan I., New Brunswick, Canada, 1 Oct 1983 (Wilson 1986). See Sullivan et al. (2005) for a photograph of the Stonechat on San Clemente I. and Beaman and Madge (1998), Robertson (1977), and Stoddart (1992) for details on identification within *Saxicola*.

VEERY *Catharus fuscescens* (11, 1). A one-year-old Veery mist-netted and banded 19 Jun 2004 on lower Rush Cr., MNO (KGr†; 2004-107; Figure 9), was the fourth recorded in spring in California.

RUFOUS-BACKED ROBIN *Turdus rufopalliatus* (13, 1). A brief description of one at the Cactus City Rest Area, RIV, 23 Nov 2003 (CMcG†; 2003-199) was accompanied by a dark digital photo that was identifiable only when digitally altered to brighten the image. This manipulation of the photograph sparked much discussion within the committee on the legitimacy of altered digital images. The committee concluded that simple brightening of digital images—as in the case of the one identifiable image supporting this record—does not affect the image's legitimacy.

CURVE-BILLED THRASHER *Toxostoma curvirostre* (17, 1). One wintering at Black Meadow Landing, Colorado River, SBE, 4 Nov 2004–20 Feb 2005 (MB, MJI†, DVP†; 2004-204) was judged to be the same individual that wintered there 2003–2004 (2004-027; San Miguel and McGrath 2005). One at Quail Hollow Day

Use Area north of Earp, SBE, 20 Feb 2004 (TE†; 2004-038) was less than 15 km from the bird at Black Meadow Landing.

*RED-THROATED PIPIT *Anthus cervinus* (204**, 5). An additional five individuals, including one documented by a specimen, were accepted, bringing the total number in the Tijuana R. valley, SD, 12–27 Oct 1964 to 17, as published by McCaskie (1966) (GMcC; #MVZ 154172; 1986-031A). The committee reviews records of the Red-throated Pipit through 1991 only.

SPRAGUE'S PIPIT *Anthus spragueii* (78, 7). Three records involving seven individuals were accepted from the Imperial Valley, where small numbers have been detected in recent years during late fall and winter. The known but ill-defined winter distribution of Sprague's Pipit extends northwest into south-central and southeastern Arizona (Alström and Mild 2003). Because the birds in the Imperial Valley are generally seen, and many remain, in appropriate winter habitat, it appears likely this region is within the extreme western edge of the species' winter range. Up to five were near Calipatria, IMP, 14 Nov 2004–19 Feb 2005 (MB, ELK, GMcC; 2004-196), one was in the Palo Verde Valley, RIV, north of Palo Verde, IMP, 27 Nov 2004 (MSanM; 2004-220), and one was near Calipatria, IMP, 15 Dec 2004 (DVP; 2005-036).

YELLOW-THROATED WARBLER *Dendroica dominica* (105, 7). An older record from Westhaven, HUM, 8 Oct 1992 was accepted (GSL†; 2004-092). The year 2004 yielded an outstanding six spring records, the best showing since 1981. All were males of the expected subspecies *albilora*; five of the six were singing: at Long Beach, LA, 25 Apr 2004 (KGL†; 2004-086); Drake's Beach, Pt. Reyes, MRN, 18–22 May 2004 (MWE; LML; 2004-094); Crissy Field, SF, 19 May 2004 (JHf; 2004-071); Furnace Cr. Ranch, Death Valley National Park, INY, 29–31 May 2004 (DVP; AH, DR, RST, SBT; 2004-078); Manzanita Lake, Lassen Volcanic National Park, SHA, 8 Jun 2004 (JMi; 2004-109; Figure 10); Big Sur R. mouth, MTY, 13 Jun 2004 (RFo, SBT; 2004-108).

GRACE'S WARBLER *Dendroica graciae* (44, 1). Two returning individuals wintered at Fort Rosecrans National Cemetery, Pt. Loma, SD: the male spent his third winter there, 17 Sep 2004–2 Apr 2005 (PAG, MTH†, GMcC, MS; 2004-145), and a female, presumably one of two there the previous winter, was observed 26 Sep 2004–2 Apr 2005 (GMcC; PAG, MTH, MS; 2004-147). A singing male was on territory at least 30 May–29 Jun 2004 at the Chimney Cr. Recreation Area campground, TUL (RAB, MJB†, RFi, LL, JMo, RSt†, LS†, SBT, DVP; 2004-079; Figure 11). According to the campground host, it had been present about three weeks before being encountered by birders on May 30. Although breeding by Grace's Warbler has yet to be confirmed in California, it has undoubtedly taken place at Clark Mt., SBE, where multiple pairs have occurred, including a pair May–Jul 2003 (San Miguel and McGrath 2005). The Grace's Warbler in Tulare County was the first recorded in the Sierra Nevada and only the second territorial individual away from Clark Mt. (the first was a male at Arrastre Cr., SBE, 15 Jun–3 Jul 1975; Luther et al. 1979). See also Records Not Accepted, identification not established.

PINE WARBLER *Dendroica pinus* (71, 4). One at China Ranch, INY, 16 Oct 2004 was the eighth for California's interior (SJM†; 2004-205). Another migrant was at Oceano, SLO, 22 Oct 2003 (JMC; 2003-189). A first-winter female 1–29 Feb 2004 furnished the fifth winter record of Pine Warbler for El Dorado Park in Long Beach, LA (KSG†; 2004-048). The park hosted at least one wintering Pine Warbler from Dec 1997 to Dec 2000. A first-winter male was at Pacific View Memorial Park in Corona del Mar, ORA, 16 Feb–17 Apr 2004 (MJI†, CAM, JPi†; 2004-041).

CERULEAN WARBLER *Dendroica cerulea* (16, 1). A singing male at the Big Sur R. mouth, MTY, 24 May 2004 (RFo; 2004-080) was California's sixth in spring and first since 1997.

WORM-EATING WARBLER *Helmitheros vermivorus* (99, 3). One was at Nunes Ranch, Pt. Reyes, MRN, 2 Oct 2004 (SBT; 2004-176); another was at the Millpond Recreation Area, Bishop, INY, 9–12 Nov 2004 (CE, JHe†, DP, JP, DHo, WHM, JZ; 2004-218). One seen in Santa Barbara, SBA, 3 Jan 1981 (BKS; 2005-084) was recently submitted and accepted.

LOUISIANA WATERTHRUSH *Seiurus motacilla* (16, 1). One at Oak Meadows Park, Los Gatos, SCL, 9–16 Aug 2004 was the fourth for northern California (JPa; WGB, MB, LWC, ME, TE†, KCK, RWL, MMR, SBT, DVP; 2004-119). The date fits the pattern for the species, which is an early migrant.

CONNECTICUT WARBLER *Oporornis agilis* (95, 3). Santa Barbara County hosted two in 2004: one at Prisoner's Cove, Santa Cruz I., 25 Sep 2004 (JLD; 2004-167), the second on the mainland in Santa Barbara 15–17 Oct 2004 (ABi; DC, JEL, NL; 2004-169). Southeast Farallon I., SF, averages just over 1.4 Connecticut Warblers per year, so one there 4 Oct 2004 (RDiG; JTz; 2004-199) was expected.

MOURNING WARBLER *Oporornis philadelphia* (127, 3). A singing male was at the Big Sur R. mouth, MTY, 5–6 Jun 2004 (RFo; RST, SBT, DVP; 2004-084). One was at Southeast Farallon I., SF, 2 Oct 2004 (KNN†; JTz; 2004-181), and another was at Mendoza Ranch, Pt. Reyes, MRN, 3 Oct 2004 (SBT; 2004-175). See also Records Not Accepted, identification not established.

SCARLET TANAGER *Piranga olivacea* (131, 6). Two records from San Diego County nearly a year apart are by far the latest for California. The first was of a first-winter male at Greenwood Memorial Park, San Diego, SD, 2 Jan 2004 (GMcC; MTH†, SBT; 2004-005). Another male, probably also in its first winter, was near Guajome Regional Park, Oceanside, SD, 30 Dec 2004 (JTz; 2004-222). Although they were detected during winter, both were likely exceptionally late migrants, as the species migrates late in fall. The majority of fall Scarlet Tanagers in California have occurred from mid-October to mid-November, with the previous latest record 13 December. Scarlet Tanagers winter primarily in the Andes of South America and are unlikely to winter within the United States. The 2004 records are among the latest for the United States. Previous January records of Scarlet Tanagers include a well-documented individual at Charleston, SC, 28 Dec 1990–13 Jan 1991 (McNair and Escobar 1993) and one from Rio Rancho, NM, 4–9 Jan 2002, preserved as a specimen (Museum of Southwestern Biology, University of New Mexico, Albuquerque, #MSB 32102) (Dickerman and Draper 2003). In their review of winter records of Scarlet Tanagers in the southeastern U.S. McNair and Escobar (1993) found that most claims lacked persuasive evidence and more likely pertained to the Summer Tanager (*P. rubra*).

Two one-year-old males were seen in the spring: one at Oso Flaco L., SLO, 4–5 Jun 2004 (CAM, ASc; 2004-082) and another at the San Bruno Mt. State and County Park, SM, 11 Jun 2004 (RFi, MH, JMo, ZT†; 2004-091; Figure 12). A first-fall male was in the Tijuana R. Valley, SD, 31 Oct–1 Nov 2004 (THu; TAB†, GMcC; 2004-177). An older record from El Capitan State Beach, SBA, 22–25 Oct 1999 was accepted (DAC; 2005-008). See also Records Not Accepted, identification not established.

CASSIN'S SPARROW *Aimophila cassini* (46, 1). One at Stinson Beach, MRN, 16–17 Sep 2004 (DSC; LWC, MWE†, SNGH†, MJM†, JMo, DN†, EPr, MMR, DSS†, RS†, DVP‡; 2004-143; Figure 13) provided a long-overdue first for Marin County. It was the first along the mainland coast in fall, although there have been eight in fall at Southeast Farallon I. and one in fall on San Clemente I.

*NELSON'S SHARP-TAILED SPARROW *Ammodramus nelsoni* (30**, 1). This record initially circulated for statistical acceptance, but the committee obtained photos to substantiate standard acceptance of this specimen, collected at Alviso, SCL, 31 Jan

Figure 13. This Cassin's Sparrow (*Aimophila cassinii*) was photographed 17 September 2004 at Stinson Beach, Marin County. Note the fine streaking on the crown and nape and delicate barring on the rump and central rectrices, which are diagnostic for the species.

Photo by Martin Meyers

1896 (MHa†, PD†; #USNM 163104; 2005-047). The committee reviews records of Nelson's Sharp-tailed Sparrow through 1986 only.

SNOW BUNTING *Plectrophenax nivalis* (105, 5). Two were in the east San Francisco Bay area: one at the San Leandro marina, ALA, 25–26 Jan 2004 (WGB, JMo, DQ, KaR†; 2004-016) and another with blacker upperparts at the Clifton Court Forebay, CC, 27 Feb–17 Mar 2004 (ASo†; LWC†, EG†, RHo†, CL, LML‡, JMo†, EPa; 2004-039). Migrants at Southeast Farallon I., SF, 26 Oct 2004 (RDiG; ABr†, NCo; 2004-209) and the mouth of the Mad R., HUM, 27 Oct 2004 (MK; 2004-173) were rather early. Another was at the north end of Lake Talawa, DN, 13 Nov 2004 (RFo†; 2004-188).

PYRRHULOXIA *Cardinalis sinuatus* (22, 1). The committee agreed to re-review the record of a Pyrrhuloxia seen at Pt. Loma, SD, 10 Jun 1998 (REW; 1999-044A) after it was initially not accepted on grounds of questionable natural occurrence. It was accepted on the second round of recirculation. The date is appropriate for a spring overshoot, as 19 of California's 22 records fall within the window of 7 May to 31 July. While most of California's Pyrrhuloxias have been seen in the southeastern deserts, records from Encinitas, SD, and, especially, from San Miguel I. 19–23 Jun 1990 (Heindel and Garrett 1995) indicate that they occasionally wander coastward and even offshore. Point Loma, although close to an urban center and the border with Mexico where the species is occasionally kept as a cage bird (Hamilton 2001), is a well-known vagrant trap. The bird's "disheveled" appearance, which caused concern during the initial voting, was considered expected for a naturally occurring second-year vagrant, which would be at the end of its molt cycle. Additionally, because the species is seldom reported within California, "background" levels of escapees appear to be low. As with other species frequently raising the issue of natural occurrence, not accepting records simply because of their location (i.e., coastal southern California for

Mexican-kept cagebirds), even if the record fits the pattern of occurrence for the state, may interfere with our understanding of these species' natural movements.

*PAINTED BUNTING *Passerina ciris* (106, 4). An adult male at the Sepulveda Wildlife Reserve, LA, 7 Aug 2004 (AL†, BK; 2004-117) initially raised some concern about natural occurrence since it was close to urban Los Angeles, but it was accepted unanimously on the second round. The date is perfect for adult males moving into the Southwest to molt, a phenomenon seen annually in southeast Arizona. Painted Buntings in their first fall were at Ridgecrest, KER, 15 Sep 2004 (AH; 2004-152), Atascadero Cr. in Goleta, SBA, 29 Sep 2004 (DC; 2004-182), and China Ranch, INY, 2 Oct 2004 (JPi†; 2004-192). The committee reviews Painted Bunting records through 2004 only. See also Records Not Accepted, identification not established.

COMMON GRACKLE *Quiscalus quiscula* (69, 3). A male returned for a second winter to the Earvin "Magic" Johnson Recreation Area, Willowbrook, LA, 11 Jan–7 Feb 2004 (KGL†; MJI; 2004-049). A first-spring male was at the headquarters of the Wister Unit, Imperial W.A., near Niland, IMP, 27 Mar 2004 (MMR†; GMcC, TMcG, DN†; 2004-046). Two were at Desert Center, RIV: one in spring on the early date of 1 Apr 2004 (CMcG†; 2004-062), the other in fall on 17 Oct 2004 (CMcG†; 2004-172). Like all Common Grackles recorded previously in California, these individuals represented the more westerly subspecies, *versicolor*. See also Records Not Accepted, identification not established.

BLACK ROSY-FINCH *Leucosticte atrata* (12, 3). Previously unreviewed specimens now accepted are an adult male from Bodie, MNO, 15 Jan 1904 (PP†; #CAS 15167; 2005-028) and a female from Blue Bell Mine, Badger Flat, INY, 1 Jan 1984 (REJ†; #CM-WSU 84-321; 2005-013). One was at Aspendell, INY, 14–18 Nov 2004 (SSt; JLD; 2004-207).

COMMON REDPOLL *Carduelis flammea* (76, 3). One was in Sierra Valley, PLU, 3 Jan 2004 (CD; 2004-031), another was at Tule Lake NWR, SIS, 26 Nov 2004 (DSh; 2005-002), and a third remained "for 3 weeks" in Dec 2004 in Eureka, HUM (DO†; 2005-032). See also Records Not Accepted, identification not established.

RECORDS NOT ACCEPTED, identification not established

GARGANEY *Anas querquedula*. A pair reported in Petaluma, SON, 29 Apr 2004 (2004-103) was not accepted because of an inadequate description of the male and no description of the female.

COMMON EIDER *Somateria mollissima*. One reported at Newport Harbor, ORA, in May 1982 (2004-186) was not accepted because of the lack of information regarding the photograph submitted 22 years later and concerns about whether the location of the photograph was mislabeled. If correct, the record would have been the first for California. The photograph (which the committee agreed was of a Common Eider) was purportedly taken during a pelagic trip when the boat was leaving from the harbor, but when questioned other participants on the trip did not recall any eider being seen. In addition, the bird was not of the expected Pacific coast subspecies (*v-nigrum*) and was missing the primaries in one wing. Therefore the committee suspects the claimed location is incorrect and suggests the photo is of a captive bird. Because both location and identification need to be established before a record is not accepted on grounds of questionable natural occurrence, this record is not accepted because its location was not established.

ARCTIC LOON *Gavia arctica*. One reported off North Beach, Pt. Reyes, MRN, 15 Dec 2001 (2001-216) received considerable support during the first two rounds but was ultimately not accepted on the fourth. Several committee members thought

the quality of the documentation was inadequate to warrant acceptance of such a rare and difficult species. The bird was reported for several days by many observers, yet details submitted to the committee were sparse. One reported near Westport, MEN, 25 Apr 2004 (2004-112) was not accepted because of the brevity of the description. The documentation for one reported near Pomponio State Beach, SM, 28 Aug 2004 (2004-136) did not provide detail sufficient to convince even the observers themselves to support the record. The Arctic Loon is relatively difficult to identify, so the committee has a high standard for its documentation. For discussion and details on the identification of this species see Reinking and Howell (1993).

YELLOW-BILLED LOON *Gavia adamsii*. One off Pt. Piedras Blancas, SLO, 12 May 2004 (2004-096) was not accepted because of the lack of a description of anything other than the bill color and shape. There was no indication of the age of the bird, the length of the sighting, the distance to the bird, or any other supporting details required to establish the record's acceptability.

SHY ALBATROSS *Thalassarche cauta*. One was reported off Pt. Piedras Blancas, SLO, 28 May 1996 (1996-093A). It was not accepted following three rounds of voting in 1997, then resubmitted in 2003 following the acceptance of other California records of the Shy Albatross (e.g. Cole 2000, Garrett and Wilson 2003), and finally not accepted on the fourth round of voting. The record raised several concerns among committee members: the observer's reported distance from the bird (2.5 miles), the fact that this would have established the first record for California, and the observer's identifying it as one subspecies, then years later changing his mind to identify it as another subspecies. Many committee members continued to support this record in the final round based upon the observer's experience and the adequacy of the description.

GALAPAGOS/HAWAIIAN PETREL *Pterodroma phaeopygia/sandwichensis*. A *Pterodroma* photographed 2 miles west of Moss Landing, MTY, 4 May 2003 (2003-048) circulated as this species pair and was rejected before being resubmitted as a Stejneger's Petrel (see below). Another was reported 20 miles off Pt. Pinos, MTY, 23 May 2004 (2004-077). Although a majority of the committee members considered the bird properly identified, the brevity of the sighting, the lack of a description, and the observers' lack of absolute certainty in their identification led to the non-acceptance of the record.

STEJNEGER'S PETREL *Pterodroma longirostris*. A *Pterodroma* was photographed 2 miles west of Moss Landing, MTY, 4 May 2003 and initially circulated as a Dark-rumped (Galapagos/Hawaiian) Petrel (*P. phaeopygia/sandwichensis*), but it was not accepted (see above). Several committee members and an experienced outside reviewer commented that the photographs matched Stejneger's Petrel more closely than the Dark-rumped. When the record was not accepted as a Dark-rumped Petrel, it was resubmitted as Stejneger's Petrel. Because there was no written description of the bird in the documentation, however, committee members had to rely solely on review of the photographs. A majority of the committee did not consider the photographs adequate to support the identification of the bird. The blurry photographs did not clearly show plumage characteristics of the dorsal surface, nor did they clearly show the facial pattern and bill shape and size. The record was ultimately not accepted as a Stejneger's either (2005-019).

PARKINSON'S PETREL *Procellaria parkinsoni*. One was reported from a pelagic trip off Pt. Reyes, MRN, 11 Oct 2004 (2004-168) but was not accepted as a first state and North American record because of the lack of photographs that showed the bird's overall shape, bill size and shape, and, most importantly, leg color sufficiently to rule out the Flesh-footed Shearwater (*Puffinus carneipes*) convincingly. The committee received considerable comment from an array of international seabird experts, but

many of these reached contradictory conclusions or were inconclusive, so the majority of the committee considered it best to let this record go. Perhaps not coincidentally, there was a well-documented record from the same general area on 1 Oct 2005, currently under review by the committee.

STREAKED SHEARWATER *Calonectris leucomelas*. One reported off Pt. Pinos, MTY, 23 Aug 2003 (2003-098) was not accepted because of concerns over the brevity of the sighting and some aspects of the description that were considered by some to be incorrect for this species.

CORY'S SHEARWATER *Calonectris diomedea*. One off Pt. Pinos, MTY, 22–23 Aug 2003 (2003-099) was not accepted because of concerns over the brevity of the sighting, lack of photographs, and the lack of details in the description of what would be the species' second record for California. Some committee members were willing to accept it only if it was considered the same bird as California's first, from Bodega Canyon, SON, 9 Aug 2003 (San Miguel and McGrath 2005), while other committee members considered it a different bird.

GREATER SHEARWATER *Puffinus gravis*. One reported off Pt. Pinos, MTY, 12 Oct 2003 (2003-178) was not accepted primarily because of the brevity of the sighting and because only the bird's dorsal surface was described. Only one observer from the pelagic trip submitted documentation, though that observer was experienced with the species. Although the record was not accepted, some committee members believe that the identification may have been correct in spite of the description's lacking sufficient detail.

MANX SHEARWATER *Puffinus puffinus*. One off Santa Barbara, SBA, 25 Oct 2003 (2003-184) was not accepted because of the brevity of the observation and the lack of a detailed description. Another from Southeast Farallon I., SF, 18 Sep 2004 (2004-190) was not accepted because the minimal documentation rested primarily on an unannotated sketch.

BROWN BOOBY *Sula leucogaster*. One off Santa Cruz, SCZ, 25 Oct 2004 (2004-174) was not accepted; the description did not rule out the Red-footed Booby (*Sula sula*).

TRICOLORED HERON *Egretta tricolor*. One near Oceanside, SD, 20 Dec 2003 (2004-156) was not accepted. The minimal description of the bird as having a "red belly"is inconsistent with this species, which has a white belly.

YELLOW-CROWNED NIGHT-HERON *Nyctanassa violacea*. An immature was reported from Zzyzx, SBE, 29 Sep 2004 (2004-213). A majority of the committee thought the description did not conclusively rule out an immature Black-crowned Night-Heron (*Nycticorax nycticorax*).

WHITE IBIS *Eudocimus albus*. A flock of 20 reported soaring over Calabasas, LA, 12 Dec 2004 (2004-216) was not accepted because committee members concluded that the documentation better described American White Pelicans (*Pelecanus erythrorhynchos*).

GLOSSY IBIS *Plegadis falcinellus*. A *Plegadis* ibis was photographed at the Piute Ponds on Edwards Air Force Base, LA, 12-23 May 2004 (2004-068). This record generated considerable discussion, and a majority of the committee considered the bird a hybrid. The committee acknowledges that much is still not known about the extent of hybridization and the variation of plumages and soft-part coloration in hybrids, as well as within the parental species. Several members supported this record, but upon gaining further information and confidence about identification of this species and of hybrids, most committee members were uncertain that this bird was a pure Glossy Ibis.

MISSISSIPPI KITE *Ictinia mississippiensis*. One reported in Blythe, RIV, 27 May 2002 (2002-111) was not accepted because of the lack of a detailed and convincing description and the poor quality of the accompanying sketch. Regardless, this record still had support from many committee members from the description of the behavior of the bird taking a dragonfly on the wing, as this species often does.

CRESTED CARACARA *Caracara cheriway*. One reported at Sheffield Reservoir, SBA, 9 Oct 2001 (2005-026) was not accepted because the documentation described only a crest, white head, black body, and yellow bill. The bill color is inconsistent with this species.

GYRFALCON *Falco rusticolus*. One reported in a backyard in Fort Bragg, MEN, 11 Nov 2004 (2005-018) received no support because of a poor description, which ruled out this species.

AMERICAN OYSTERCATCHER *Haematopus palliatus*. One at Albert's Anchorage on Santa Cruz I., SBA, 15 Feb 2004 (2004-034) was not accepted because of the lack of a description. The Channel Islands are an area where hybrids with the Black Oystercatcher (*H. bachmani*) have previously occurred, so reports of this species must effectively rule out hybrids. The index devised by Jehl (1985) is an effective tool for identifying—or eliminating—hybrid oystercatchers in California.

COMMON GREENSHANK *Tringa nebularia*. One at Hayward Regional Shoreline, ALA, 11 May 2003 (2004-083) was not accepted primarily because of the lack of corroboration from other observers, the fact that the bird was not reported until a year after the sighting, and the lack of detail in the description. Most committee members considered the documentation inadequate for an unprecedented spring record of a Eurasian shorebird known only from a single record from the west coast south of Alaska, of one in McKinleyville, HUM, in fall 2001, returning in fall 2002 (Garrett and Wilson 2003).

BAR-TAILED GODWIT *Limosa lapponica*. One at Bodega Bay, SON, 6 Jul 2004 (2004-137) was not accepted because of concerns over the brevity and incompleteness of the sighting, the early date, and the fact that it could have been a worn and bleached small Marbled Godwit (*L. fedoa*).

WHITE-RUMPED SANDPIPER *Calidris fuscicollis*. One at Pope Marsh, South Lake Tahoe, ED, 16 May 2004 (2004-069) was not accepted because the description did not eliminate other shorebirds with white rumps such as the Red Knot (*C. canutus*), Curlew (*C. ferruginea*) and Stilt (*C. himantopus*) sandpipers, and Wilson's Phalarope (*Phalaropus tricolor*).

RED-NECKED STINT *Calidris ruficollis*. One described as a molting adult at the Salmon Cr. mouth, SON, 10 Aug 2004 (2005-021) was considered by a majority of the committee to be inadequately documented. Several concerns were raised, including the lack of descriptions from other observers, the lack of consideration of an alternate-plumaged Sanderling (*C. alba*), the description of spotting across the breast, the lack of description of some important field marks, and the lack of photographs to corroborate the identification.

LITTLE STINT *Calidris minuta*. One in Albany, ALA, 10–15 Aug 2004 (2004-132) was not accepted because the description did not convincingly address the bird's age or rule out the similar Red-necked Stint (*C. ruficollis*), nor were photographs taken of this difficult-to-identify species.

LESSER BLACK-BACKED GULL *Larus fuscus*. One at the Sunnyvale Water Pollution Control Plant, SCL, 14 Jan 2004 (2004-036) was not accepted because of the brevity of the sighting and the lack of description of leg and eye color. One along the American River Parkway in Sacramento, SAC, 13–14 Mar 2004 (2004-111) was not

accepted because the description lacked detail sufficient to convince the committee of the identification. Another at Rodeo Lagoon, MRN, 29 Dec 2003 (2004-100) was not accepted because of inconsistencies between the description and known characteristics of this species—primarily the lack of streaking in the head and the dull "fleshy" colored legs—and the lack of photographs. Committee members commented on the relative rarity of this species in California and the many pitfalls of identifying large gulls and estimating their ages. Reports of this species should include detailed descriptions that carefully eliminate other species, and adequate photographs if possible.

SLATY-BACKED GULL *Larus schistisagus*. An adult gull reported from Beal's Point on Folsom Lake, PLA, 5–6 Jan 1998 (2002-195) generated considerable discussion and many members' support, but was ultimately not accepted in the fourth round of voting. A primary concern was the paleness of the mantle that may indicate a hybrid with the Asian subspecies of the Herring Gull, *L. argentatus vegae*. The majority of the committee considered that this bird was not typical enough of a Slaty-backed Gull to be convincing as a first state record.

DUSKY-CAPPED FLYCATCHER *Myiarchus tuberculifer*. One reported from Southeast Farallon I. Oct 24 2004 (2004-208) would have established the earliest fall date for California. Two descriptions noted that the primaries were edged rufous, but no mention was made of the edges of the secondaries, which are rufous in Dusky-capped Flycatcher and whitish in other North American species of *Myiarchus*. Details of the head pattern, such as the noticeably pale throat and relatively uniformly colored head, more suggested the Ash-throated Flycatcher (*Myiarchus cinerascens*). The observers noted that the tail lacked rufous but did not indicate if the rufous was absent from the underside of the tail. Ultimately, most committee members thought the bird may have been a freshly molted Ash-throated Flycatcher, which can be strikingly bright yellow below relative to its plumage during the breeding season.

GREAT CRESTED FLYCATCHER *Myiarchus crinitus*. A *Myiarchus* with features suggesting a Great Crested Flycatcher was observed briefly at the Cosumnes R. Preserve, SAC, 5 Jul 2004 (2004-120). Most members considered this record to lack the level of detail to establish such a significant record, as there are no spring or summer records of this species for California, and 80% of the state's records fall within the narrow window of 16 September to 13 October. Additionally, several members thought the Brown-crested Flycatcher (*M. tyrannulus*), which may be more likely than the Great Crested given the date and location, was not eliminated.

BLUE-HEADED VIREO *Vireo solitarius*. Several older records preceding the split of the Solitary Vireo complex into three species lacked details sufficient to gain acceptance: two from Southeast Farallon I., SF, one 10–11 Sep 1977 (2002-069), the other 26–28 Oct 1982 (2002-075); one from the San Lorenzo R., SCZ, 5 Oct 1992 (2002-086); one near New Brighton State Beach, SCZ, 10 Oct 1993 (2002-089); and one from La Selva Beach, SCZ, 24 Oct 1994 (2002-092). A bird observed 15 May 2004 (2004-067) at the Mid Hills Campground in the Mojave National Preserve, SBE, was tentatively identified as this species by a careful observer. The bird was not exceptionally bright, apparently in the realm of a dull Blue-headed Vireo or bright male Cassin's Vireo (*V. cassinii*), which can be difficult to distinguish. Some details such as the tail pattern were not observed, and, given the scarcity of spring records for the West, the record was not accepted. A singing vireo reported near Westmorland, IMP, 20 May 1976 (2005-034) was initially identified as a Blue-headed, but the observer has since lost confidence in that identification. In part because of the Blue-headed Vireo's extreme scarcity in California in spring, the observer wished to have this record not accepted, because it had been published as *V.* s. *solitarius* in *American Birds* 30:892. Several members commented that the bird may have been identified correctly but thought the judgment of the observer was valid.

YELLOW-GREEN VIREO *Vireo flavoviridis*. A bonded pair with the male singing was reported near Klamath, DN, 5–7 Jul 2004 (2005-038). There are no spring records for California and no summer records further north than southern Arizona, so a mated pair from northern California would be unprecedented. Sound recordings and a verbal description were submitted with the report, yet it was unclear if the recordings submitted were from the birds in question or intended to provide examples demonstrating differences among the vireos' songs and calls, as recordings of the Red-eyed (*V. olivaceus*), Warbling (*V. gilvus*), and Philadelphia (*V. philadelphicus*) were also included for comparison with the Yellow-green. Considering how much more likely a pair of Red-eyed Vireos would be at the reported location (the Red-eyed Vireo has bred in California, *Field Notes* 49:982), and that no conclusive evidence such as a photograph or verification by another observer was obtained, the committee thought the record should not be accepted.

SPRAGUE'S PIPIT *Anthus spragueii*. A very brief description of five individuals in a plowed field near Abbott's Lagoon, MRN, 13–20 Nov 2004 (2004-198) received no support, as the Red-throated Pipit (*A. cervinus*) or even Savannah Sparrow (*Passerculus sandwichensis*) could not be eliminated.

GRACE'S WARBLER *Dendroica graciae*. One was reported from Lighthouse Field State Park, SCZ, 2 Nov 2004 (2004-201). The supercilium and some other field marks were incompletely described, and some members thought the bird may have been a bright male Audubon's Warbler (*D. coronata auduboni*) known to be in the area.

MOURNING WARBLER *Oporornis philadelphia*. An intriguing *Oporornis* tentatively identified as a Mourning Warbler was observed at Galileo Hill, KER, 15 Sep 2004 (2004-157). Mourning Warblers vary significantly, particularly in the size and shape of the eye ring (e.g., Fig. 12 in Garrett and Wilson 2003) and throat color. This bird had features somewhat atypical of the Mourning Warbler and suggesting MacGillivray's Warbler (*O. tolmiei*), leading the committee not to accept it.

RED-FACED WARBLER *Cardellina rubrifrons*. One reported from Sonora Pass, TUO, 2 Jul 2002 (2002-128) took four rounds before being not accepted. Although the bird was fairly well described, it was observed very briefly, possibly without binoculars, at an unlikely location, and so failed to convince half the committee.

SCARLET TANAGER *Piranga olivacea*. An older record involving a bird seen at the Oceano Campground, SLO, 24 Nov 1991 (2004-029) may have been correct, but the description was too brief and lacked detail.

FLAME-COLORED TANAGER *Piranga bidentata*. One reported from Torrance, LA, 12 Apr 2004 received no support (2004-098). It was observed feeding on bird seed spilled on the ground, behavior unexpected for a tanager. Combined with the short description, the behavior led most members to think the bird was more likely a Black-headed Grosbeak (*Pheucticus melanocephalus*) or perhaps an escaped exotic.

SMITH'S LONGSPUR *Calcarius pictus*. The report of one in a mixed flock of longspurs near the Calipatria State Prison, IMP, 30 Dec 2002 (2003-001) was nearly accepted during its first circulation but was ultimately not accepted in the third round. Although the bird was seen by experienced observers, crucial field marks, particularly the wing-covert pattern and primary-tip spacing, were not described, and some members thought observing the tail pattern while the bird was in flight was insufficient to distinguish between Smith's and the Lapland (*C. lapponicus*), which can appear very similar. Most of the difference in the tail pattern between the two species is in the inner webs of rectrices 4 and 5, which are difficult to observe in flight. Additionally, no call was heard. Longspurs as a group vary considerably within species; documentation of a rarity such as a Smith's Longspur requires scrupulous detail. Some committee

members were also concerned that the bird was never seen again, though it would not have been expected to leave its wintering flock.

PAINTED BUNTING *Passerina ciris*. A puzzling bird reported from Red Mt., MEN, 2 May 2004 (2004-072) was described as having upperparts suggesting an adult male Painted Bunting: a red rump and greenish-yellow back, although the head was described as blackish and the wings as brownish-red. The underparts were described as greenish, consistent with a female or immature male, but should be red in an adult male. Male Painted Buntings in their first spring are usually greenish overall, but some show some red or blue feathers. Although this record possibly involved a gynandromorphic plumage, combining male and female characters, the song, described as resembling that of a Lazuli Bunting (*P. amoena*), was additional reason to believe the bird was not a Painted Bunting. The Painted Bunting's song, though similar in quality to that of other *Passerina* buntings, is warbling, sweet, and smooth, unlike the relatively harsh and double-noted song of a Lazuli Bunting.

COMMON GRACKLE *Quiscalus quiscula*. Three records had details insufficient for acceptance: one near Fort Dick, DN, 18 Oct–11 Nov 2003 (2003-163), one in Ridgecrest, KER, 19–20 Mar 2004 (2004-051), and one in Irvine, ORA, 27 Jun 2004 (2004-140) that likely pertained to a Great-tailed Grackle (*Q. mexicanus*).

COMMON REDPOLL *Carduelis flammea*. Two reported visiting a feeder 5–16 May 2004 at South Lake Tahoe, ED (2004-065), were described as being the same size as the nearby *Carpodacus* finches, yet redpolls are notably smaller. Additionally, the description lacked detail, particularly on the bill, which is remarkably small in redpolls. The date was also unlikely for redpolls in California.

RECORDS NOT ACCEPTED, identification accepted but natural occurrence questionable

HAWAIIAN GOOSE *Branta sandvicensis*. One at Jenner along the Russian River, SON, 3–22 May 2002 (2003-025) was not accepted because of the extreme unlikelihood that it was a wild bird. The Hawaiian Goose is a sedentary species endemic to Hawaii (Madge and Burn 1988).

TRUMPETER SWAN *Cygnus buccinator*. Two first-year swans were collared with alphanumeric codes 8Y3 and 9Y3 as cygnets in Idaho. The former was photographed at Hansen Dam, LA, 23–24 Dec 2004 and was relocated at Lake Havasu NWR, SBE (and adjacent Arizona), 6 Mar 2005 (2004-219). The latter appeared in Goleta, SBA 8–12 Dec 2004 and was found dead on 17 Dec (2005-012). Because Trumpeter Swans were transplanted several hundred miles to southern Idaho in order to reestablish a population and these birds were known to have come from that population, the majority of the committee members thought that they may not have flown to California if they had not been artificially relocated in Idaho.

HARRIS'S HAWK *Parabuteo unicinctus*. One at Ramona, SD, 11 Oct 2004 (2005-022) was not accepted because it was wearing jesses and leg bands, signifying that it had been a captive bird.

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This report would not have been possible without the 183 observers who submitted reports to the committee. Other individuals contributed to the committee's review of particular species in the main report and in the appendix: Krista Fahy, Santa Barbara Museum of Natural History, for information on the Snowy Owl and Yellow Rail; Mary Hennen, Field Museum of Natural History, for photographs of Sharp-tailed Sparrow specimens; Carla Cicero, Kim Tsao, and Julie Woodruff, Museum of Vertebrate Zool-

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CORRIGENDA

The following corrections should be made to the Report of the California Bird Records Committee: 2003 Records (San Miguel and McGrath 2005). We thank Guy McCaskie for bringing these to our attention.

On page 87 under the Blue-footed Booby, the date for the Oregon record should be 7–9 Sep 2002, not 7–9 Oct 2002.

On page 89 "Glossy Ibis *Plegadis falcinellus* (6, 2)" should be changed to "Glossy Ibis *Plegadis falcinellus* (5, 2)."

On page 93 under the Yellow Rail, the fact that John C. Sterling submitted sound recordings as part of his documentation of the vocalizing bird near the city of Mount Shasta should be added to record 2003-092.

On page 102 under Le Conte's Sparrow, the initials for Jim Tietz should be added to the list of those submitting documentation, as one of two finding and/or identifying the bird.

On page 103 under the Painted Bunting, the dates for the two at Andrew Molera State Park are 31 Aug–16 Sep 2003 (2003-113A) and 16 Sep 2003 (2003-113B).

On page 107 under the Blue-headed Vireo, the earliest CBRC-endorsed date for a fall migrant in California is 9–13 Sep 1995 (as listed on page 99), not 14 Sep 1986.

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APPENDIX 1: EVALUATION OF HISTORICAL AND UNREVIEWED RECORDS

Over its 35-year existence, the California Bird Records Committee has tried to identify and evaluate historical records of species on its review list. In its early years, it reviewed a number of records preceding its establishment in 1970; by its third report (Luther et al. 1979), the committee was reviewing significant historical records. At its 1984 annual meeting, the committee decided to "fulfill its primary purposes of evaluating, publishing, and storing records of California rarities by reviewing all reports, including those which are quite old" (Roberson 1986). Toward that end, it "obtained unpublished notes, reviewed published accounts, and considered extant specimens." The results of this historical review began to be published in the ninth report (Roberson 1986), and much was published in the fourteenth report (Roberson 1993).

On the basis of a discussion at the CBRC's 1994 meeting, an informal subcommittee was formed. Michael A. Patten, Matthew T. Heindel, and Richard A. Erickson searched through the committee's archives to find records formally accepted but whose documentation was only marginally acceptable. The intent was to have the entire committee "demote" those records to being accepted only statistically. This was done to balance the decision (actually finalized in 1999, see category 4 below) to accept statistically nine records not accepted because of shortcomings in their documentation but that the committee unanimously agreed were accurate.

Continuing this effort as part of the background research for the committee's forthcoming monograph *Rare Birds of California*, and following through on a decision by the CBRC at its 2004 meeting, Erickson (on behalf of the original subcommittee) reviewed the records statistically accepted and proposed for statistical acceptance. In 2004 the subcommittee's recommendations were presented to the full committee for formal consideration. In addition to the 22 records originally recommended for "demotion," the subcommittee recommended that the following be accepted only

"statistically": (1) 65 old records never questioned but never formally reviewed by CBRC (usually involving specimens and most published in the 14th CBRC report); (2) 25 instances of periods undocumented/unreviewed before, between, or after periods accepted for returning or long-staying individuals; (3) the nine records accepted statistically in 1999, plus one late addition; and (4) three specimen records published in the second CBRC report but never formally reviewed by CBRC. These groupings changed and grew somewhat when the full committee considered them, but in general they correspond to categories 1 and 3, 2, 4, and 5, respectively, discussed below.

The subcommittee also recommended that four groups of records be considered not accepted, but only "statistically." These included: (1) eight old Yellow-billed Loon records not accepted by Remsen and Binford (1975) and published as not accepted in the 14th CBRC report; (2) 10 records not accepted for various reasons; (3) 14 old records never fully established (at least according to the CBRC) and lacking extant documentation, most published in the 14th report; (4) all outstanding pre-1970 records lacking adequate documentation, that is, unsubmitted. The first two groups are covered in categories 6 and 7 below, but the other two are not addressed here.

In 2004 the full committee rejected many of the subcommittee's recommendations and put its own stamp on the proceedings. To make its appraisal as complete as possible, the committee sought to evaluate various categories of unreviewed records. Some of the records identified, although based on specimens, cannot be reviewed; in many cases, the specimens have been lost, many to the 1906 San Francisco earthquake and fire, which destroyed the collection of the California Academy of Sciences. In the 1980s, the committee created a category for such records, "statistical acceptance," allowing it to count such presumably valid records toward the total number of occurrences of a particular species in the state. For the first time here, the committee also uses statistical acceptance for instances of periods undocumented or unreviewed in years before, between, or after accepted periods for records involving returning or long-staying individuals; in these instances, documentation is not available but the committee is persuaded the birds in question were indeed present. Records statistically accepted, restricted to these two categories, are designated by an asterisk (*) below and in all the committee's publications.

The compilation of records by the subcommittee identified a number of records problematic in their earlier resolution by the committee, and in 2004 the committee sought to resolve these problems. It was almost unanimous in being comfortable with a list of unreviewed records. Furthermore, it did not want to create special categories to treat a tiny fraction of the records. It did want to reserve the asterisk of statistical acceptance for known specimen-supported records historically published but not currently reviewable and gaps in the documentation for long-staying or returning (multi-year) individuals. The committee's review of the records reported here differed from its normal record review in that there was no documentation for any of the records; committee members were voting on *policies* toward sets of records, mostly trying to make the committee's approaches over the years consistent.

During its term, the 2004 committee considered several categories of historical records:

1. Historical Records for Statistical Acceptance

This category contains historical specimen-based records, most published in ornithological journals and by Grinnell and Miller (1944). Because many of the specimens are no longer extant, review of them is impossible, although the committee found no reason to question them; for those records supported by existing specimens (discovered through this process) the committee plans future review. The number following the location is the committee's record number.

EMPEROR GOOSE *Chen canagica* (adding 19 records of 20 birds). Grinnell and Miller (1944) listed these records on the basis of their earlier publication elsewhere. Some of the specimens have since been lost. These records were mentioned in

the ninth report (Roberson 1986), but the committee took no formal action at that time.

winter 1884	Humboldt Bay, HUM	2004-500*	Townsend 1886
1 Nov 1895	vic. Gridley, BUT	2004-501*	Loomis 1901a
? Dec 1906	Davis, YOL	2004-502*	Bryant 1915
3 Nov 1910	Rio Vista, SOL	2004-503*	female; Littlejohn 1912
? Nov 1912	Colusa, COL	2004-504*	juv. male; #MVZ 24508; Bryant 1914
? Dec 1912	Ingomar, MER	2004-505*	Bryant 1914
15 Nov 1913	10 mi. w. of Modesto, STA	2004-506*	Bryant 1914
late Oct 1915	vic. Gridley, BUT	2004-507*	Muller 1916
fall 1916	Norman, GLE	2004-508*	Hunter 1918
ca. 1921	Rio Vista, SOL	2004-509*	imm.; #MVZ 59137
1 Mar 1925	Humboldt Bay, HUM	2004-510*	imm.; #MVZ 52036; Grinnell 1931; Zerlang and Fraser 1931
26 Apr 1925	Humboldt Bay, HUM	2004-511*	male; Davis 1940
3 Dec 1927	Humboldt Bay, HUM	2004-512*	imm. male; #MVZ 57187; Zerlang and Fraser 1931
6 Dec 1927	Humboldt Bay, HUM	2004-513*	male and female; Davis 1940
13 Dec 1928	Limantour, MRN	2004-514*	adult; #CAS 43715; Orr 1944
20 Jan 1930	Pit R. near McArthur, SHA	2004-515*	#MVZ 54483; Grinnell 1931
2 Nov 1932	Willows, GLE	2004-516*	Grinnell and Miller 1944
20 Dec 1932	Willows, GLE	2004-518*	#MVZ 63663; Beck 1934; Grinnell and Miller (1944) erroneously reported this as 20 Dec 1933
27 Jan 1933	Humboldt Bay, HUM	2004-517*	male; #MVZ 71275

The November 1932 report from Willows is unsupported by any specimen or publication other than Grinnell and Miller (1944). The December 1932 specimen from Willows is listed by Grinnell and Miller (1944) and on its specimen tag at MVZ as taken 20 Dec *1933*, but a close reading of Beck (1934) indicates that he became aware of this specimen in February 1933 and thus the date he reported of 20 Dec 1932 is presumably the correct one.

PARAKEET AUKLET *Aethia psittacula* (adding 5 records of 8 birds). The following specimen records were published by Grinnell and Miller (1944) and in earlier literature; the specimens, in the California Academy of Sciences, were lost in the 1906 San Francisco earthquake and fire. The records were mentioned in the ninth report (Roberson 1986), but the committee took no formal action at that time.

10 Jan 1895	San Francisco, SF	2004-519*	male; Loomis 1901b
8 Jan 1899	San Francisco, SF	2004-520*	male and female; Loomis 1901b
17 Dec 1899	San Francisco, SF	2004-521*	male and female; Loomis 1901b
14 Jan 1905	Monterey Bay, MTY	2004-522a*	1 bird; Beck 1907
17 Jan 1905	Monterey Bay, MTY	2004-522b*	2 birds; Beck 1907

SNOWY OWL *Bubo scandiacus* (adding 4 records). Grinnell and Miller (1944) listed the following records on the basis of their publication in earlier literature. The specimen from Lake Earl was at the Santa Barbara Museum of Natural History but was destroyed by a fire there in 1961 (K. Fahy pers. comm.).

26 Dec 1908	near Eureka, HUM	2004-523*	Clay 1909
1 Nov 1916	Lake Earl, DN	2004-524*	adult female; Dawson 1923
17 Nov 1916	Upper Mattole, HUM	2004-525*	Smith 1917
17 Nov 1916	Trinidad, HUM	2004-526*	Smith 1917

2. Returning or Long-staying Rarities for Statistical Acceptance

This category includes instances of periods of undocumented or unreviewed years between, before, or after accepted periods for records of returning or long-staying individuals. Each of the birds involved in the records below has been accepted for some part of its stay, and the committee sought to fill in unreviewed periods by accepting for statistical purposes the missing dates, the vast majority of which have been published in *Field Notes* or *American Birds*. Returning birds do not add to the overall number of occurrences of a species in the state.

TUFTED DUCK *Aythya fuligula*. A male Tufted Duck previously accepted for two of the five winters it spent at Lake Sherwood, VEN (winter 1973-74, 1974-025; winter 1974-75, 1976-025; Luther et al. 1979), was statistically accepted for the remaining three winters, noted but not reviewed by Luther et al. (1979): 25–31 Jan 1973 (2004-585*; *Am. Birds* 27:662), 19 Nov 1975–late Feb 1976 (2004-586*; *Am. Birds* 30:126, 30:765), and 19 Nov 1976–31 Jan 1977 (2004-587*; *Am. Birds* 31:222, 31:372). A male wintering in Tiburon and Mill Valley, MRN, from Dec 1976 (1977-004; Luther 1980) through Mar 1982 (1982-046; Morlan 1985) was statistically accepted for the date span mentioned but not reviewed by Morlan (1985), 12 Dec 1980–13 Feb 1981 (2004-588*; *Am. Birds* 35:715). A male wintering at Limantour and Drakes Bay, MRN, from Jan 1978 (1978-078; Luther et al. 1983) through Dec 1981 (1980-237/1981-044; Binford 1985) was statistically accepted for the following dates, mentioned but not reviewed by Roberson (1993): 29 Sep 1979–12 Jan 1980 (2004-589*; *Am. Birds* 34:195, 34:303) and 3 Oct–27 Dec 1980 (2004-590*; *Am. Birds* 35:221, 35:332). A male that wintered at Quail Lake, LA, and nearby Cuddy Valley, KER, between Dec 1978 (1980-049; Binford 1985) and Nov 1991 (1992-019; Patten et al. 1995) was statistically accepted for the one unreviewed winter (noted by Roberson 1993), 15 Oct 1985–winter 1986 (2004-591*; *Am. Birds* 40:158).

REDDISH EGRET *Egretta rufescens*. An easily recognizable individual Reddish Egret with a bill deformity that was first documented at San Diego Bay, SD, Dec 1982 (1984-045/1984-049; Roberson 1986) and returned for 19 winters—through 23 Dec 2001 (2001–136; Garrett and Wilson 2003)—to the San Diego Bay/Tijuana R. mouth area, SD, had been accepted by the committee for 19 of its 20 seasons in California. The committee voted to accept for statistical purposes the sole missing season it spent at the Tijuana R. mouth, 19 Aug 1999–9 Feb 2000 (2004-527*; *N. Am. Birds* 54:220). This bird, adult when first discovered in 1982, is the oldest documented Reddish Egret ever (Garrett and Wilson 2003; cf. Lowther and Paul 2002, who reported the longevity record for the Reddish Egret to be 12 years, 3 months).

YELLOW-CROWNED NIGHT-HERON *Nyctanassa violacea*. A Yellow-crowned Night-Heron that summered at San Rafael, MRN, 12 Jul–*18 Sep* 1968 (1977-126) and for the following five years was reviewed and formally accepted only for the first year, although Luther (1980) mentioned the subsequent years. The committee statistically accepted the returning bird for the following dates listed by Luther (1980): 3 May and 14 Jul–3 Sep 1969 (2004-595*; *Am. Birds* 23:620, 23:690, 24:89), 30 Jun–27 Jul 1970 (2004-596*; *Am. Birds* 24:712), 29 May–"summer" 1971 (2004-597*; *Am. Birds* 25:794, 25:900); 28 May–18 Jul and 5 Nov 1972 (2004-598*; *Am. Birds* 26:803, 26:900, 27:113), and 8 Apr–29 Jun and mid-Oct 1973 (2004-599*; *Am. Birds* 27:815, 27:913).

The long-staying Yellow-crowned at San Elijo Lagoon, Scripps Institute of Oceanography, La Jolla, and elsewhere around San Diego, SD, has been accepted for 21 separate time periods during its intermittent stay from 25 Oct 1981 (1981-088; Binford 1985) to 17 Apr 2001 (2001-069; Garrett and Wilson 2003). The committee accepted for statistical purposes the unreviewed dates of 19–31 Mar 1985 (2004-600*; Bevier 1990) for this bird. Although there is little data on longevity of

the Yellow-crowned Night-Heron (Watts 1995), this bird was documented for almost 20 years and is the longest-lived of the species we can find in the literature.

ZONE-TAILED HAWK *Buteo albonotatus*. A Zone-tailed Hawk that spent seven of the eight winters between 13 Jan 1979 (1979-040; Binford 1985) and 1 Mar 1987 (1988-108; Roberson 1993) around Whelan Lake, Vista, and Guajome Regional Park, SD, was statistically accepted for the period 21–24 Feb 1986 that it spent at Vista (2004-601*; *Am. Birds* 40:334, Roberson 1993). The committee accepted for statistical purposes a record of an adult Zone-tailed at Hot Springs Mt., SD, during "summer 1989" (2004-528*; *Am. Birds* 43:1366) as one of a pair that summered at this location beginning in 1986 (1986-332; Langham 1991). A Zone-tailed that wintered at Ojai, VEN, each year from 1993 (1993-194; Erickson and Terrill 1996) through Dec 1997 (1997-183; Rottenborn and Morlan 2000) was statistically accepted for the one interval not reviewed, 28 Aug 1994–17 Feb 1995 (2004-529*; *Field Notes* 49:196).

PIPING PLOVER *Charadrius melodus*. California's first Piping Plover has been reviewed formally only for the fourth winter it spent at Goleta, SBA (1974-084; Luther et al. 1979). The committee accepted for statistical purposes this same bird's three previous visits to Goleta: 14–18 Apr 1971 (2004-530*; *Am. Birds* 26:655, Lehman 1994), 16 Dec 1971–22 Apr 1972 (2004-531*; *Am. Birds* 26:655, 26:808; photo in Roberson 1980), and 16 Dec 1972–6 Jan 1973 (2004-532*; *Am. Birds* 27:663, Lehman 1994).

LITTLE GULL *Larus minutus*. A Little Gull that spent 11 winters in the Stockton area from March 1979 (1979-021; Luther et al. 1983) to March 1989 (1989-046; Pyle and McCaskie 1992) was statistically accepted for the period 11 Dec 1987–18 Apr 1988 that it spent at the Stockton Waste Treatment Plant, SJ (2004-533*; *Am. Birds* 43:316, 43:478). The original documentation for this record was lost during its initial circulation in 1988.

BLACK-HEADED GULL *Larus ridibundus*. A Black-headed Gull that returned to the Stockton Waste Treatment Plant, SJ, for eight winters beginning in March 1979 (1979-020; Luther et al. 1983) had been reviewed and accepted only for six of those seasons; the committee statistically accepted the missing winters of 7–12 Nov 1980 (2004-534*; *Am. Birds* 35:221) and 10 Nov 1981–8 Apr 1982 (2004-535*; *Am. Birds* 36:214, 36:890).

BARRED OWL *Strix varia*. The committee statistically accepted three unreviewed date spans for a long-present male Barred Owl ±3 mi. e. of Crescent City, DN, one of California's first, first detected 12 Mar 1982 (1982-026; Binford 1985) and last reported in April 1989 (1989-051; Pyle and McCaskie 1992): 17 Feb–29 Sep 1984 (2004-538*; *Am. Birds* 38:354), 19 Mar–21 Dec 1986 (2004-540*; *Am. Birds* 40:520, 41:324), and 28 Sep–27 Dec 1987 (2004-542*; *Am. Birds* 42:316).

GREATER PEWEE *Contopus pertinax*. A Greater Pewee that wintered at Griffith Park, LA, for five winters between 7 Nov 1979 (1980-019; Binford 1983) and 23 Mar 1984 (1983-088; Roberson 1986) was statistically accepted for the previously unreviewed period 3 Nov 1980–23 Feb 1981 (2004-602*; *Am. Birds* 35:227, 35:336).

THICK-BILLED KINGBIRD *Tyrannus crassirostris*. The committee accepted for statistical purposes reports of a Thick-billed Kingbird that spent nine winters at Peters Canyon, ORA, for the unreviewed period 8 Nov 1984–6 April 1985 (2004-543*; *Am. Birds* 39:103, 39:211, 39:350); the bird had previously been accepted for winters starting in Dec 1982 (1982-110; Morlan 1985) and concluding in Jan 1992 (1992-068; Patten et al. 1995). The committee also statistically accepted reports of a Thick-billed Kingbird at Santa Paula, VEN, for "winter 1999–2000" (2004-603*) and "winter 2000–2001" (2004-604*) as the bird had been accepted for the periods

23 Feb–3 Mar 1999 (1999-086; Rogers and Jaramillo 2002) and 19 Nov–21 Dec 2002 (2002-220; Cole and McCaskie 2004).

SKY LARK *Alauda arvensis*. California's only Sky Lark wintered at Pt. Reyes, MRN, from Dec 1978 (1979-004; Luther 1980) to Feb 1985 (1984-256; Dunn 1988). The committee accepted for statistical purposes three winters that it had acknowledged (Binford 1985) but not reviewed: 27 Oct–1 Nov 1979 (2004-544*; *Am. Birds* 34:197), 25 Oct 1980–21 Feb 1981 (2004-545*; *Am. Birds* 35:222, 35:333), and 31 Oct 1982–29 Jan 1983 (2004-546*; *Am. Birds* 37:221; Morlan and Erickson 1983).

GRACE'S WARBLER *Dendroica graciae*. A male that wintered at Montecito, SBA, from Jan 1980 (1980-023; Binford 1983) to Dec 1987 (1987-273; Pyle and McCaskie 1992) was statistically accepted for the unreviewed periods 10 Oct 1981–10 Mar 1982 (2004-536*; *Am. Birds* 36:332; Binford 1983) and 11 Oct 1982–1 Apr 1983 (2004-537*; *Am. Birds* 37:340, 37:913). This bird, which returned for nine seasons, is the longest-lived Grace's Warbler documented (Stacier and Guzy 2002). A male wintering at Carpinteria, SBA, from Feb 1980 (1980-119; Binford 1983) to Mar 1984 (1984-062; Roberson 1986) was statistically accepted for the unreviewed period 24 Oct 1982–12 Mar 1983 (2004-539*; *Am. Birds* 37:340, 37:913; Lehman 1994; Binford 1983).

WORM-EATING WARBLER *Helmitheros vermivorus*. The committee statistically accepted a Worm-eating Warbler that returned to Whaley Park, Long Beach, LA, 1–5 Nov 1982 (2004-541*; *Am. Birds* 37:225) after wintering there 5 Nov 1981–21 Mar 1982 (1982-005; Binford 1985) and a second bird at Recreation Park, Long Beach, 5 Nov 1982–9 Mar 1983 (2004-605*; *Am. Birds* 37:225) that was previously accepted as being at that park 6 Nov 1981 (1983-037; Roberson 1986).

NELSON'S SHARP-TAILED SPARROW *Ammodramus nelsoni*. A Nelson's Sharp-tailed Sparrow previously accepted as spending 27 Dec 1970–20 Feb 1971 (1978-015; Luther 1980) and 20 Dec 1972–1 Jan 1973 (1977-151; Luther 1980) at Dumbarton Pt., ALA, was statistically accepted as returning the intervening winter, 2 Nov 1971–1 Jan 1972 (2004-547*; *Am. Birds* 26:113, 26:653) and on 8 Jan 1974 (2004-548*; *Am. Birds* 28:690). One accepted as wintering at Upper Newport Bay, ORA, during the winters of 1972–73 (1973-022; Winter and McCaskie 1975), 1974–75, and 1976–77 was statistically accepted for the two missing winters: 29 Nov 1973–late Feb 1974 (2004-549*; Sexton and Hunt 1979) and 30 Nov 1975–14 Mar 1976 (2004-550*; *Am. Birds* 30:130, 30:770). One that wintered at Bolinas Lagoon, MRN each year from 4 Feb 1977 (1977-014; Luther 1980) seasonally through 23 Jan 1987 (1986-452; Langham 1991) was statistically accepted for the one missing year, 12 Dec 1981 (2004-551*; *American Birds* 36:329).

3. Records Earlier Statistically Accepted but Not Previously Published

YELLOW RAIL *Coturnicops noveboracensis* (adding 11 records). The committee previously statistically accepted the following records on the basis of their publication by Grinnell and Miller (1944) but did not give them record numbers; we remedy that oversight here and cite the committee reports in which they appeared as well as publications of them in addition to Grinnell and Miller. The first five records were based on specimens lost in the 1906 San Francisco earthquake and fire.

undated 1800s	near Alviso, SCL	2004-572*	Dunn 1988, Roberson 1993
28 Dec 1883	Alvarado, ALA	2004-573*	Dunn 1988
24 Apr 1889	Quincy, PLU	2004-574*	Dunn 1988
12 Dec 1896	Newport Bay, ORA	2004-575*	Dunn 1988
? Nov 1905	Pajaro R. near Pajaro, MTY	2004-576*	Roberson 1993
8 Dec 1915	Suisun Marsh, SOL	2004-577*	Dunn 1988
6 Jun 1922	Long Valley, MNO	2004-578*	nest with 8 eggs; Dawson 1922, 1923:1544–1548; Dunn 1988

1 Jun 1939	Bridgeport Valley, MNO	2004-579*	nest; Heaton 1940; Dunn 1988
2 Jun 1939	Bridgeport Valley, MNO	2004-580*	nest; Heaton 1940; Dunn 1988
? Jun 1939	Bridgeport Valley, MNO	2004-581*	additional birds heard; Heaton 1940; Roberson 1993
4 Jun 1939	Long Valley, MNO	2004-582*	nest; Heaton 1940; Roberson 1993

UPLAND SANDPIPER *Bartramia longicauda* (adding 1 record). At its 2003 meeting the committee statistically accepted the record from Tule Lake, SIS/MOD (2004-583*), 8 Aug 1896 on the basis of Cooke (1910) and Grinnell and Miller (1944), who reported "a wing of this bird was mailed to Washington, D.C., to ensure correctness of the field identification, but was not preserved."

YELLOW-GREEN VIREO *Vireo flavoviridis* (adding 1 record). At its 2003 meeting, the committee statistically accepted a record from Riverside, RIV (2004-584*), 29 Sep 1887. The record, based on a specimen since lost, was published by Price (1888) (who took the specimen) and Ridgway (1904) (who confirmed the identification). Price (1888) gave the date of collection as 1 Oct 1887, but Ridgway (1904:146) noted that the specimen label specified the date as 29 Sep 1887; the committee chose to follow Ridgway (1904).

4. Records Treated Inconsistently, Returned to Not Accepted, Identification Not Established

At its 1999 meeting, the committee voted to move 10 controversial records from "not accepted" to "statistically accepted." In 2004, under its policy of limiting statistical acceptance to two categories, the committee decided that such treatment was not appropriate for these records, which had undergone review.

EMPEROR GOOSE *Chen canagica*. Two reported at Limantour Estero, MRN, 14–29 Dec 1968 (1989-094) were not accepted in Patten et al. (1995) and return to that status.

TUFTED DUCK *Aythya fuligula*. One reported at Cape Mendocino, HUM, 23 Feb 1980 (1986-326) was not accepted in Patten and Erickson (1994) and returns to that status.

REDDISH EGRET *Egretta rufescens*. One reported at Pt. Mugu, VEN, 18 Aug–mid Nov 1969 (1986-461) was not accepted in Roberson (1993) and returns to that status.

YELLOW-THROATED WARBLER *Dendroica dominica*. One reported at the Carmel R. mouth, MTY, 21–28 Sep 1969 (1989-093) was not accepted in Patten et al. (1995); records from Southeast Farallon I., SF, 4 Jun 1978 (1988-020) and 2–7 May 1980 (1988-021; banded) were not accepted in Heindel and Garrett (1995). All three return to "not accepted, identification not established."

PROTHONOTARY WARBLER *Protonotaria citrea*. One reported from Malibu, LA, 30 Sep–11 Oct 1979 (1987-152) was not accepted in Heindel and Garrett (1995) and returns to that status.

WORM-EATING WARBLER *Helmitheros vermivorus*. One at Pacific Grove, MTY, 21 Oct 1972 (1996-065) was statistically accepted at the 1999 meeting (Rogers and Jaramillo 2002); as it never circulated completely through the committee, it returns to "unreviewed" status. One banded at Southeast Farallon I., SF, 5 Jun 1973 (1987-204) was not accepted in Heindel and Garrett (1995) and returns to that status.

SNOW BUNTING *Plectrophenax nivalis*. One reported from Southeast Farallon I., SF, 26 Oct 1972 (1987-251) was not accepted in Heindel and Garrett (1995) and returns to that status.

5. Unreviewed Specimen Records Previously Published by the Committee

Three records published as "Specimen Records" in the committee's second report (Winter and McCaskie 1975) were never formally reviewed. These are based on specimens of a first-fall Rose-breasted Grosbeak from Brock Research Center, IMP, 24 Sep 1972 (#SBCM 5112), a first-fall Indigo Bunting from Pachalka Spring, SBE, 1 Oct 1972 (#SBCM 50962004-541), and a first-fall Orchard Oriole from Pachalka Spring 30 Sep 1972 (1973-008, #SBCM 5057). The committee will investigate the status of these specimens and, if possible, formally review them. Because their publication by Winter and McCaskie (1975) may imply they were accepted, we clarify here that these records remained unreviewed.

6. Records Published as "Not Accepted" That Actually Remain Unreviewed

In the committee's 14th report, in summarizing historical records of the Yellow-billed Loon, Roberson (1986) reported that "Remsen and Binford (1975) found no or insufficient evidence to support the following records: Stinson Beach, MRN, 28 Apr 1965; Limantour, MRN, 4 Mar 1969; Big Lagoon, HUM, 19–23 Mar 1969; Bodega Bay, SON, 26 Dec 1970; Bodega Bay, SON, 21 Jan 1971 (2); Bodega Bay, SON, 25 Feb 1971; Bodega Bay, SON, 13 Feb 1972." Although the report calls these records "not accepted," they were never formally voted on and are thus unreviewed.

7. Miscellaneous Records Not Accepted, Identification Not Established

The reasons for not accepting the following records are not typical. For example, the bird was not in California, or the record was withdrawn by the observer. But the committee did not want to establish new categories of non-acceptance. Under the committee's bylaws records can not be withdrawn once circulation of the record has begun, although this policy has not always been followed consistently.

EMPEROR GOOSE *Chen canagica*. One reported at Humboldt Bay, HUM, 30 Dec 1972 (2004-562) was withdrawn by the observer. A goose reported at San Diego, SD, 16 Dec 1989 (2004-563) was published as an Emperor (cf. *Am. Birds* 44:987) but was actually a Ross's Goose (*C. rossii*).

TUFTED DUCK *Aythya fuligula*. One reported at Tiburon, MRN, 19 Jan 1979 (2004-564) was withdrawn by the observer.

YELLOW-BILLED LOON *Gavia adamsii*. One reported at Pt. Reyes, MRN, 3 Oct 1977 (2004-565) was withdrawn by the observer.

UPLAND SANDPIPER *Bartramia longicauda*. One reported at Southeast Farallon I., SF, 23 May 1969 (2004-566) was withdrawn by the observer.

DUSKY-CAPPED FLYCATCHER *Myiarchus tuberculifer*. One near Walters Camp, Cibola N. W. R., Arizona, 9–14 Nov 1977 (2004-567) was not in California (see Rosenberg et al. 1991:237).

PHILADELPHIA VIREO *Vireo philadelphicus*. A specimen collected at Harper Dry Lake, SBE, 30 Sep 1990 (2004-568; #SBCM 52709) is actually a Warbling Vireo (*V. gilvus*), and the record was withdrawn by the observer (cf. *Am. Birds* 45:152, 45:1163).

PINE WARBLER *Dendroica pinus*. One reported at Riverside, RIV, 6 Dec 1969 (2004-569) was withdrawn by the observer.

CERULEAN WARBLER *Dendroica cerulea*. A Blackburnian Warbler (*D. fusca*) at Morongo Valley, SBE, 26–30 Oct 1991 (2004-570) was erroneously published as a Cerulean Warbler by Small (1994).

PROTHONOTARY WARBLER *Protonotaria citrea*. One reported off San Diego, SD, 21 May 1967 (2004-571; *Audubon Field Notes* 21:541) was actually south of the international boundary near Islas Los Coronados, Baja California, Mexico (Jehl 1977).

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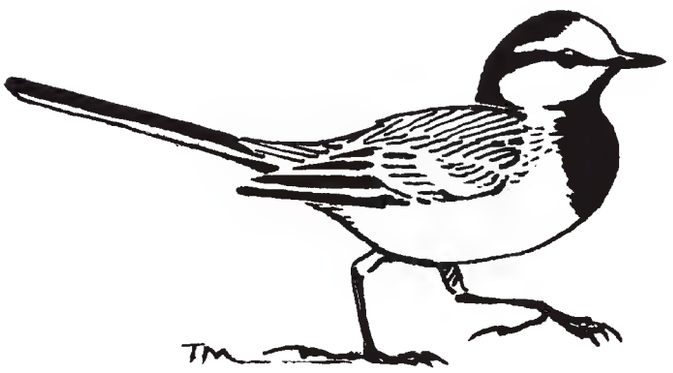

NOTES

FIRST DOCUMENTED RECORD OF THE BARRED OWL IN THE SOUTHERN SIERRA NEVADA

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The range expansion of the Barred Owl (*Strix varia*) into California is being documented incidentally during the annual monitoring of the Northern Spotted Owl (*S. occidentalis caurina*) and the California Spotted Owl (*S. o. occidentalis*) at sites of timber sales and demographic studies in northern California and along the Sierra Nevada. Barred Owls were first recorded in northwestern California in 1981 and have subsequently been observed over much of the northern third of the state, as far south as Nevada County in the Sierra Nevada (Dark et al. 1998) and Marin County along the Coast Range (D. Adams, Point Reyes National Seashore, pers. comm.) (Figure1). Recent Barred Owl sightings include a pair in Lassen National Forest in 2002 (D. Shaw, U. S. Forest Service, Chester, pers. comm.) and a single individual in the Plumas National Forest in 2004 (P. Shaklee, U. S. Forest Service, Quincy, pers. comm.). Gordon Gould (California Department of Fish and Game, Sacramento,

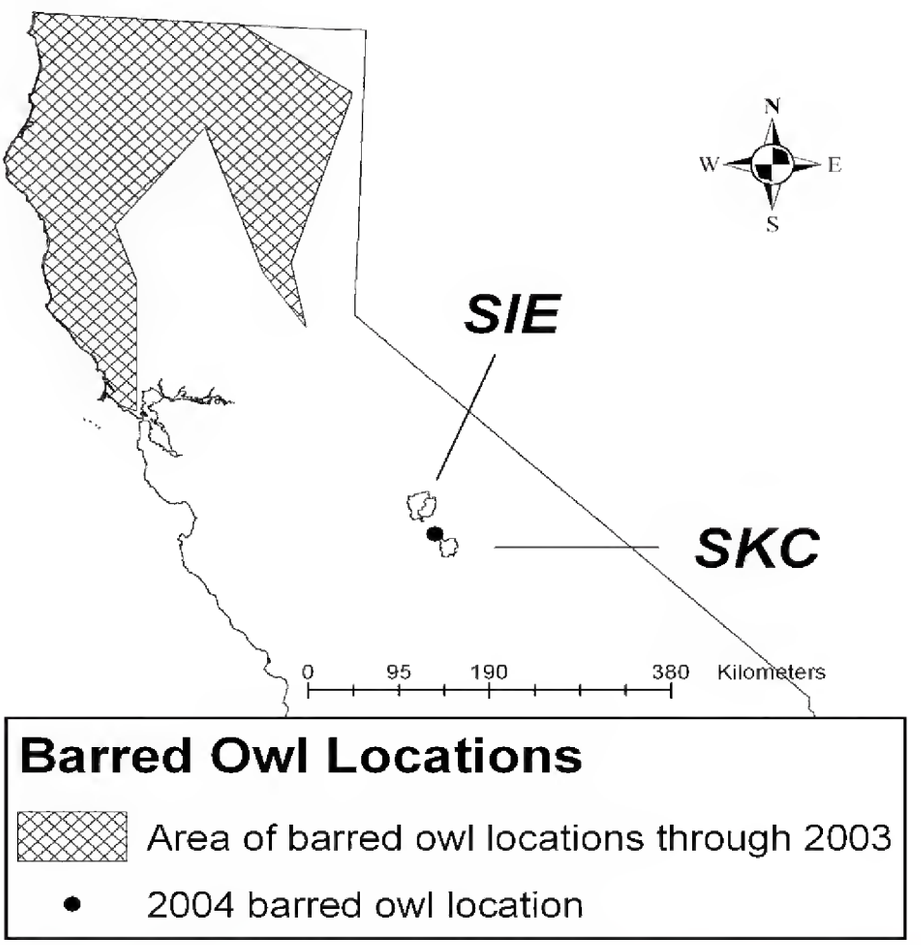

Figure 1. Sierra National Forest (SIE) and the Sequoia and Kings Canyon National Parks (SKC) study areas for Spotted Owl demography and the previously known range of the Barred Owl in California (modified from Dark et al. 1998). •, 1 June 2004 detection of the Barred Owl in Kings Canyon National Park.

pers. comm.) informed us that the 2003 California Department of Fish and Game database on Barred and Spotted Owl locations had no new detections of the Barred Owl south of those previously reported by Dark et al. (1998). Subsequently, Seamans et al. (2004) encountered a hybrid Barred × Spotted Owl during a demographic study of the Spotted Owl in the Eldorado National Forest, Placer County, in 2003, and a pair consisting of two hybrids was detected there in 2004 (M. Seamans pers. comm.). There is one unconfirmed report of a Barred Owl in 1991 near Hume Lake in the Sequoia National Forest, Fresno County. This observation had no follow-up by Forest Service biologists to confirm the identification of the bird, and no formal documentation of the sighting was filed.

We detected a male Barred Owl on 1 June 2004 at 19:23 while surveying for California Spotted Owls along Sequoia Creek in Kings Canyon National Park, Tulare County (Figure 1). The owl was located just north of the Big Stump parking area (36° 43' N, 118° 58' W) at an elevation of 1890 m; this location is approximately 350 km southeast of any previously reported location of a Barred Owl in California and 265 km from the Barred × Spotted pair found in Placer County. The Barred Owl, responding to an imitation of the Spotted Owl's call, gave the typical Barred Owl call of "who cooks for you—who cooks for you all—," and the volume of the call was greater than that of the typical Spotted Owl vocalization. The bird was wary of our presence, did not respond to offered prey, and was difficult to observe, but we made visual contact for 2 minutes, enabling us to confirm its identity as a Barred Owl. We returned on 2 June 2004 at 10:50 and watched the owl for 22 minutes in a white fir (*Abies concolor*). The roosting area of this Barred Owl was within Kings Canyon National Park approximately 200 m from the border of the Sequoia National Forest. The vegetation at the site was a mixed conifer forest of white fir, sugar pine (*Pinus lambertiana*), ponderosa pine (*P. ponderosa*), and young giant sequoia (*Sequoiadendron giganteum*) with a canopy cover of 85% as estimated from aerial photographs taken in 2000. The area within the park had been prescribed-burned in the summer of 2002, resulting in removal of most of the understory vegetation. Although the fire's intensity varied across the area burned, the roost area used by the Barred Owl showed moderate to heavy scorching of trees >25 cm in diameter. On 3 June 2004 we found the Barred Owl again, with the aid of mobbing Steller's Jays (*Cyanocitta stelleri*), roosting in an incense cedar (*Calocedrus decurrens*) 146 cm in diameter at breast height (dbh), in the same roost area as previously described. Again, the owl was wary of humans and moved to another tree where we were able to get several photographs (Figure 2) before it moved to a dense white fir to roost. The Barred Owl was last observed on 7 June 2004 in this same roost tree. After 7 June 2004 we visited the Sequoia Creek site 14 times, 7 in the vicinity of the roost area and 7 visits 0.25 to 1 km north and east of the roost area. Using vocal calls to elicit responses, we also surveyed sites within 2 km to the north, east, and south of Sequoia Creek. The area to the west was outside our study area and was not surveyed, so the Barred Owl may have moved into an area where it would not have been detected.

The Barred Owl was found within one of two areas of study of the Spotted Owl's demographics in the southern Sierra Nevada (Figure 1): Sequoia and Kings Canyon National Parks (SKC) and Sierra National Forest (SIE). In these studies, initiated in 1990 by the Pacific Southwest Research Station, Spotted Owls have been banded and monitored for 15 years. The site where the Barred Owl was detected has been occupied by Spotted Owls for all 15 years of this study, and reproduction was successful 5 times, producing 7 young. The female Spotted Owl identified at this site was at least 2 years old and unbanded when detected in 2004; she replaced a female that had been a resident for 9 years (1995–2003). In 2003, a one-year-old male replaced an adult male last observed in 2002. The replacement male was visually identified by band color in 2004 prior to the Barred Owl detection. At the time of the Barred Owl's discovery we were attempting to assess the reproductive success of the pair of

Figure 2. Barred Owl perched on white fir branch in Kings Canyon National Park, California, 3 June 2004.

Photo by George N. Steger

Spotted Owls that we confirmed were nesting on 4 May 2004, approximately 250 m from where the Barred Owl was later observed roosting. The nest tree was a white fir snag, 120 cm dbh, with canopy cover of 81%. The Spotted Owls were not detected while the Barred Owl was known to be in the roost area. The male Spotted Owl was relocated on 24 June 2004, approximately 350 m northwest of the nest tree, and the female Spotted Owl was detected near the male on 29 June 2004. Visits to the site on 29 and 30 June indicated that these Spotted Owls did not reproduce in 2004.

Our record from Kings Canyon National Park provides the first documentation of the Barred Owl for the southern Sierra Nevada and the southernmost record yet for California. The presence of Barred Owls in the southern Sierra Nevada may have detrimental effects on the population of California Spotted Owls because of hybridization or competition for food and space. Kelly et al. (2003) warned land managers and regulatory agencies that Barred Owls should be regarded as a threat to Spotted Owls in Oregon. Kelly and Forsman (2004) hypothesized that competition for food and space is a more serious long-term threat to Spotted Owls than is hybridization. In northern California and Oregon the numbers of Barred Owls have been increasing and displacement of paired Spotted Owls has been observed (Dark et al. 1998, Kelly et al. 2003). Our record suggests that Barred Owls may be able to disperse over great distances or that Barred Owls have moved incrementally south without detection.

Results from the Pacific Northwest (e.g., Kelly et al. 2003, Pearson and Livezey 2003, Kelly and Forsman 2004) suggest that future increases in the size and distribution of the Barred Owl population in the Sierra Nevada may pose additional threats to the California Spotted Owl's population viability.

NOTES

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CONFIRMED BREEDING OF THE GREATER YELLOWLEGS IN SOUTHERN SOUTHEAST ALASKA

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The known breeding range of the Greater Yellowlegs (*Tringa melanoleuca*) extends from Newfoundland, Labrador, and Nova Scotia west to east-central British Columbia and southern Alaska (AOU 1998). In Alaska, this species nests from Etolin and Kupreanof islands in southeast Alaska north and west to Kodiak Island, the Alaska Peninsula, and the western Yukon River valley (Elphick and Tibbitts 1998). The breeding status of this species along the coast of northern British Columbia (Campbell et al. 1990) and southern southeast Alaska has not been determined (Elphick and Tibbitts 1998), primarily due to a lack of observers. In June 1909, Swarth (1911) reported seeing birds which he thought might be nesting on Duke Island, one of the southernmost islands in southeast Alaska, but he provided few details. Although the Greater Yellowlegs breeds in the central interior of British Columbia, Campbell et al. (1990) mentioned only one possible breeding record from coastal British Columbia, at Porcher Island, which they excluded because of a lack of evidence. Breeding records for Etolin and Kupreanof islands (Willett 1921, Gabrielson and Lincoln 1959), 150 km north of the U.S.–Canada border, are the southernmost ones published for southeast Alaska. Here we extend the confirmed breeding range of the Greater Yellowlegs into southernmost southeast Alaska to 54° 40′ N latitude (Figure 1) and lend support to undocumented breeding reports from the adjacent coast of northwestern British Columbia.

On the basis of 16 years of personal observations (1990–2005), we have found the Greater Yellowlegs to be a fairly common migrant and uncommon breeder in southern southeast Alaska. Near the city of Ketchikan, it is the first shorebird to arrive in spring, normally by early April, occasionally by late March (earliest, 21 March 2004, T. and P. Hunt, and 23 March 2002). During the breeding season it has been found near ponds and marshes in open muskeg bogs, habitat favored by this species for nesting (Elphick and Tibbitts 1998). In southern southeast Alaska, muskegs, or *Sphagnum* bogs, commonly fill poorly drained low-lying areas and are covered with sparse, scrubby shore pine (*Pinus contorta*) and shrubs, including stunted yellow cedar (*Chamaecyparis nootkatensis*), common juniper (*Juniperus communis*), bog-laurel (*Kalmia polifolia*), Labrador tea (*Ledum palustre*), and sweet gale (*Myrica gale*), interspersed with isolated dense stands of pine, yellow cedar, and western hemlock (*Tsuga heterophylla*) and mountain hemlock (*T. mertensiana*) (Pojar and MacKinnon 1994: 19). Virtually the entire southwest portion of Annette Island and the northeastern shore of Gravina Island—areas where we have observed yellowlegs annually during the breeding season—are covered by muskegs.

Breeding Greater Yellowlegs begin establishing territories by mid-April. We observed copulating pairs in April at Pennock Island (11 April 1998) and Gravina Island (25 April 2001). Singing and displaying birds were found regularly to early June (e.g., 20, including displaying birds, at Annette Island 6 May 1995 and 13, including displaying birds, over approximately 5 km of muskeg along the northeast shore of Gravina Island 16 June 2002). Greater Yellowlegs were also found during the breeding season at Pennock Island (displaying bird 12 June 1993), Revillagigedo Island (six agitated adults near Manzanita Creek, 19 June 2002, C. Tighe; a defensive adult collected near Harriet Hunt Lake, 2 July 2001, University of Alaska Museum 13578, enlarged testes, J. M. Maley), Prince of Wales Island (two agitated adults at Klawock 25 May 1981; an apparent "nesting" pair at Shipley Bay 9 June 1977; two agitated adults at Control Lake 20 June 1979—all T. E. Kogut), and Kosciusko Island (an apparent

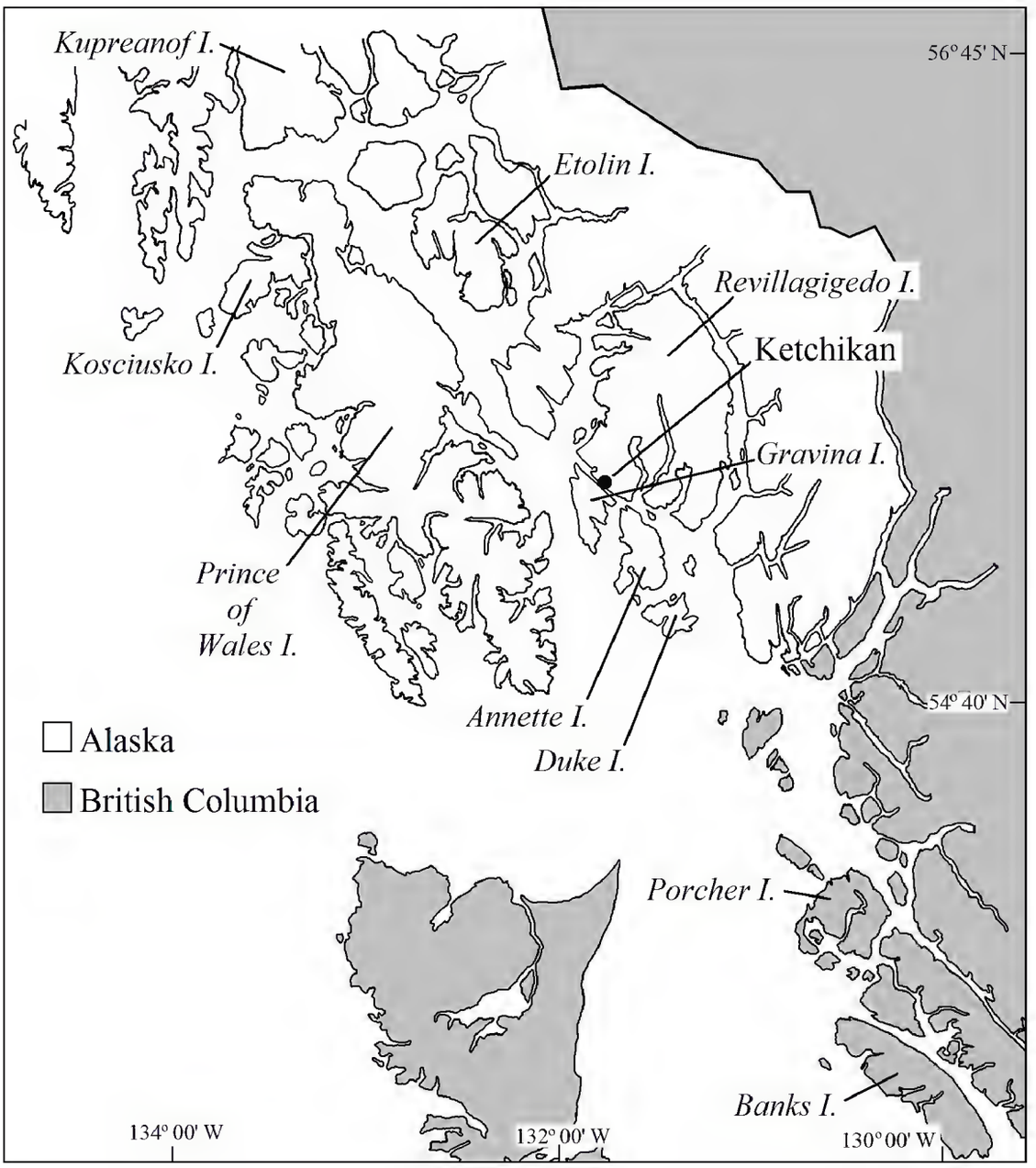

Figure 1. Southern southeast Alaska and the coast of northern British Columbia, showing the city of Ketchikan and islands mentioned in the text.

"nesting" pair 30 May 1978, T. E. Kogut). We frequently observed agitated adults through mid-July, and we encountered aggressive adults on virtually every trip through suitable habitat at Gravina Island to at least 17 July (1991). The adults call loudly and continuously at the sight of a human intruder, often flying in from some distance, diving and flying around the intruder and alighting on the tops of nearby trees and snags. This behavior makes locating nests and downy young extremely difficult, and we have only three confirmed nesting records from our area. Malcolm E. Isleib found a pair attending downy young at Annette Island 4 June 1987. J. C. Preus and M. Gebhard flushed an adult from a nest with two eggs under a small shrub at Gravina Island in early June 1998. Finally, J. E. Piston flushed an adult from a nest with four eggs under a shrubby shore pine at Gravina Island 8 May 2004 (Figure 2). The breeding schedule and nest placement (on the ground under short trees) correspond with other information published from Alaska (Gabrielson and Lincoln 1959, Elphick and Tibbitts 1998).

Figure 2. Nest of the Greater Yellowlegs at Gravina Island 8 May 2004. The nest was placed on the ground beneath a shrubby shore pine (*Pinus contorta*), at the edge of a muskeg bog.

Photo by J. E. Piston

The Greater Yellowlegs is conspicuous during the breeding season in suitable habitat in southern southeast Alaska, and our records suggest that it breeds regularly throughout the region. The small number of nests documented in the region reflects the lack of observer effort and the difficulty of locating the nests, not a lack of breeding

birds. Although Swarth (1911) did not confirm nesting of the Greater Yellowlegs on Duke Island, the proximity of Duke to Annette Island (<1 km) and Duke's extensive breeding habitat lend support to his belief that Greater Yellowlegs were nesting there. Charles de B. Green spent June and July 1921 on Porcher Island, British Columbia, roughly 65 km south of the Alaska–Canada border, where he reported the Greater Yellowlegs to be a fairly common breeder ("young were already hatched...the last week of May") in the island's extensive muskegs (Brooks 1923). Although Campbell et al. (1990) excluded this report from their account of the species' breeding for British Columbia, they mentioned another report of yellowlegs on territory and, according to the observer, "obviously breeding" at Banks Island and suggested that this report supported C. de B. Green's record. We believe our records from nearby southern southeast Alaska lend further credibility to these reports of breeding Greater Yellowlegs in coastal northwest British Columbia. Until further observations confirm this possibility, however, we can extend the known breeding range of this species only to the southernmost edge of southeast Alaska.

We thank Daniel D. Gibson, University of Alaska Museum, Fairbanks, for providing unpublished records and specimen data and for his review comments. Chris Elphick and Lee Tibbitts provided excellent comments that improved the manuscript. We especially thank John Preus, Mary Gebhard, and Joe E. Piston for sharing their records of yellowlegs nests with us.

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BOOK REVIEWS

Arizona Breeding Bird Atlas, by Troy E. Corman and Cathryn Wise-Gervais (editors). 2005. University of New Mexico Press, Albuquerque. 645 pages, 270 maps, over 320 color photos, 455 charts. Hardback $45 (ISBN 0-8263-3379-6).

Arizona, although not bordering any large body of water, can boast one of the largest cumulative species lists of any North American state or province, some 535 species (as of December 2005). Until the recent publication of the Arizona Breeding Bird Atlas (hereafter ABBA), few publications had dealt specifically with breeding birds in the state. Apart from a few regional bird-finding guides (e.g. southeastern Arizona, Maricopa County, Grand Canyon, Navajo Indian Reservation), the main bodies of work covering Arizona's breeding birds were the monumental *Birds of Arizona* by Phillips, Monson, and Marshall (published 1964) and the more regional *Birds of the Lower Colorado River* by Rosenberg, Ohmart, Hunter, and Anderson (published 1991). Therefore, the time was ripe for a comprehensive treatment of Arizona's breeding birds. The stated goal of the ABBA is to provide a "snapshot" of the distribution of breeding birds in Arizona at the end of the 20th century. This very attractive publication thus provides a visual presentation of a wealth of data collected during the atlas' study period (1993–2000) and is an extremely useful tool for researchers and birders alike.

The introductory portions of the book cover a variety of subjects, from the design of the project (including sampling methods and objectives) to the description of data collection. Following protocols set forth by the North American Ornithological Atlas Committee in 1990, Arizona was divided into 1899 "quads" based on Geological Survey maps covering 7.5 minutes of latitude and longitude. Furthermore, a priority-block system was devised to divide the quads and allow for random sampling within them. It was mainly these priority blocks that were sampled by the more than 700 volunteers and researchers (an impressive number!). Data are presented on 1834 of the possible 1899 quads, and the authors describe in detail various limitations of the data, including variation in habitats within quads, variability in skill level among atlasers, difficulty in sampling remote and rugged areas, limitations on entering private and Native American lands, etc. One may quibble about aspects of the methods, or about what data were ultimately presented, and why, but the bottom line is that for the first time most of the state was surveyed for breeding birds, and the book is a faithful presentation of that survey.

Before I get to the meat of the book, the species accounts, I should mention that the authors have also included a very interesting and informative section on the geography, climate, and habitats of Arizona. Full-page maps depicting Arizona's topography, biotic communities, and annual precipitation are of great interest, as are discussions of the radical environmental changes Arizona has experienced over the years. Other maps depicting riparian areas, selected towns and cities, and dams, lakes, and water impoundments are all useful but unfortunately somewhat lacking in detail and completeness. For example, none of the many sewage-treatment facilities are depicted on the maps (figure 14), yet these have become an important component of Arizona's aquatic habitats. This section also describes 30 habitat types by which field observers were asked to classify bird sightings in the blocks. A nice color photo, written description, and discussion of each habitat's status and distribution within the state are included. Although this section is written in a nontechnical fashion (e. g., no scientific names for any plants), it gives the reader a good understanding of the habitat heterogeneity within Arizona.

The bulk of the book consists of 270 core species accounts for each species confirmed breeding in Arizona during the atlas period. A supplemental section includes 47 additional species that were rare and local confirmed breeders during the atlas period, species only suspected as breeding that occurred in proper habitat and season,

and species that bred historically (prior to 1993) but were not found breeding during the atlas period. A few species, such as the Eastern Wood-Pewee, Yellow-throated Vireo, and Carolina Wren included in the supplemental list on the basis of territorial singing males likely represented vagrants as opposed to true range extensions. Each core account consists of a small color photograph, usually with the species engaging in some type of breeding activity, a large map showing the quads in which breeding was confirmed, probable, or possible, and written sections on habitat, breeding, and distribution and status. The design of the accounts was well conceived, with each species taking up two full pages and all the maps in the lower right corner of the right-hand page. All accounts have an attractive bar graph depicting frequency data with regard to habitat types and a small chart presenting the numerical data depicted on the maps (number of quads, blocks, etc.).

The first thing I looked at when I opened the book was the visual presentation of the breeding data, as depicted in the maps. The maps are relatively large (5.5 × 4.5 inches) and easy to read. They are gray, contrasting nicely against the white pages, and all counties are shown in a thin but distinct black line. Each quad where the species occurred is plotted on the state map in one of three colors (black for confirmed, green for probable, and white for possible; definitions for these categories are in the introduction). My main criticism of the maps is that the template does not have any landmarks other than county boundaries. This minimal background makes determining the quads' exact locations very difficult. Perhaps the authors felt a justification in presenting location data this way as a means of protecting both "sensitive" nesting information and private landowners (as they described for presenting locations of the quads only, not the priority blocks). But I don't see what harm would have been done by including major mountain ranges, rivers, cities, or towns on the template, which would have made the maps easier to read.

The text accompanying the maps is generally very informative. The first section addresses habitat, mainly as a written description of habitat data presented in the bar graph, as related to the distribution around Arizona for the 30 described habitats. Next is a section on "breeding." Although it is stated that breeding information (e.g., timing of breeding, nesting behavior, etc.) was not a focus of the project, it is included here. A "breeding phenology" graph is presented for species with 10 or more records of confirmed breeding. Finally, there is a "distribution and status" section that describes the species' overall range, its current status and distribution in Arizona, and any interesting previously published historical aspects of that distribution. It is important to look at the current distribution on the map *and* read the distribution section, because the map alone presents only data from the project, and, for a variety of reasons, the actual distribution may not be completely represented by the map. Geographic variation and racial differences were largely ignored, with only occasional reference to unique subspecies found in Arizona. This is unfortunate and detracts from the scientific status of the work. At least one photograph associated with the accounts, that of the Orange-crowned Warbler, appears to represent a migrant and wintering subspecies (*lutescens*), not the breeding subspecies (*orestera*). Perhaps one of the more useful sections of the book is the bibliography, which takes up 19 pages and has more than 900 citations.

It is difficult to find much fault with the ABBA. As in any project of this magnitude, evaluating the accuracy of the data is difficult except by comparing the maps with others previously published, such as those in *Birds of Arizona*. Given the incredible number of observers who took part, it would not be surprising if skill levels varied greatly (as pointed out by the authors), but one hopes that the sheer amount of data swamps out any small inconsistencies caused by possible misidentifications. Of more concern is the missing of species altogether in areas where they do occur. Breaking up quads into six blocks and then selecting one at random may account for "missing" data because priority blocks may not have included preferred habitats of rarer

species. The editors considered this problem, however, and included supplemental observation data to compensate for such situations. The question is, then, what was the purpose and advantage of using a system of randomly selected priority blocks in the first place—something not well justified in the introductory material. As all aspects of this atlas project are purely descriptive, from presence/absence of bird species to specific habitats in which it is found, why invoke a constrained priority-block system that may miss critical habitats within the quads? Perhaps seeking out "good-looking" habitats within a quad might have maximized the species found nesting within that quad and minimized missing rare species? This appears to have been done, but to what extent is unclear.

One might ask what are the ramifications of missing breeding birds? A primary goal of the ABBA was to provide baseline data for long-term comparisons—say with another atlas survey conducted 20 years hence. These sorts of comparisons can be very informative for common species that are increasing or decreasing in widespread habitats. For rare or difficult-to-detect species, however, such comparisons may be more problematic. As an example, let's look at the Red-breasted Nuthatch in southeastern Arizona. The map shows this species as absent from the Santa Rita Mountains and as only a possible breeder in the Santa Catalina Mountains. The text does mention that absence from the Santa Ritas (during the atlas period) may have been due to lack of coverage of specific habitats. But the species' status as only a possible breeder in the Santa Catalinas is inexplicable, as it clearly breeds there (compare *Birds of Arizona*, and the presence of calling birds in habitat and season); perhaps the birds were not vocal during atlas visits, or perhaps the habitats this species prefers were not included in the priority block sampled? One may argue that such data don't reflect true status, and, therefore, future comparisons might be equally misleading. Let's hope such examples are rare and will not detract from the overall usefulness of the atlas.

Without doubt, the ABBA should be viewed as a very important work, the first of its kind for Arizona. One may argue about aspects of study design, or the presentation of some data, but there should be no argument with regard to the monumental effort by the Arizona Game and Fish Department, the editors, project leaders, field crews, and many volunteers, all of whom are responsible for bringing what was just an idea in the mid 1980s to the final product we see today. Anyone interested in the distribution of birds in Arizona should have a copy of the ABBA, and I hope the work will serve as an inspiration towards furthering our ever-growing knowledge of Arizona birds.

Gary H. Rosenberg

National Geographic Society Complete Birds of North America, edited by Jonathan Alderfer. 2005. National Geographic Society. 664 pages, 150 color photos, numerous color illustrations, maps. Hardback, $35 (ISBN 0-7922-4175-4).

Another book on North American birds, I hear you ask. Do we really need this, and how is it complete? The unfortunate marketing-oriented title immediately dates the book—at least two species recorded from California in fall 2005 (Hornby's Storm-Petrel and Parkinson's Petrel) are missing from this *Complete Birds of North America* (hereafter CBNA), which is intended as a handbook-style companion to the National Geographic Society's (NGS) *Field Guide to the Birds of North America*. It's a great idea, going beyond the field guides with more information on the identification of all birds recorded in North America: a book to be consulted when the conventional field guides just don't give you enough information. The experience of numerous field observers was drawn upon to write the text, which was reviewed and edited by Jonathan Alderfer, with help from Jon Dunn. Most of the illustrations are recycled from the NGS *Field Guide*, but numerous new paintings are also included, and 150 color photos are scattered through the text.

My review may be controversial in more than one respect. I was involved in writing some of the text, so isn't there a conventional taboo against my reviewing the book? But what is convention?

"Perfect for novices or veterans [but not both?], the *National Geographic Complete Birds of North America* is a definitive, must-have resource for every birder" proclaims the jacket blurb. And much of the information is accessible to novices, for example, the introduction, which is a superb (but too short, at a mere four pages) attempt to cover the basics for all levels. And then the book is packed with information, and attractively laid out—so what are the down sides? Well, sadly, the CBNA manifests the same slapdash approach applied to the NGS field guides, with the result that the different styles of numerous artists assail the eyes of the user. Contrast this heterogeneity with the uniform user-friendly appearance of the *Sibley Guide to Birds of North America*. For example, anyone hoping to identify a female Costa's Hummingbird will be challenged by the substandard illustrations recycled in CBNA. The short tail of Costa's is one its best marks, but these misleading pictures show the tail longer than the wings. And compare the wing/tail proportions of the perched immature male and female Rufous Hummingbirds; they're almost criminal. And the "subadult" Long-tailed Jaeger is a composite with the underwings of an adult and the tail projections of a juvenile. I recommend relying on the text more than on the illustrations, which vary from excellent (some) through good to fair (most) to downright awful (some). I'm sure the editors know which pictures need to be repainted, but this hasn't been done—yet. Not caring enough to redress such glaring problems shouts out that NGS thinks little or nothing of the reader—inaction speaks louder than words. Yes, it would have taken time and money to get some pictures repainted, but the book would be so much better for it.

The text has its own problems. The book had a preordained page plan, so that the contents of each page-spread were estimated at the start, then writers had to work with word counts that fitted the text into the white space around each illustration. It doesn't take long to realize that species with a single illustration, such as the Green Jay, are often unmistakable and you don't need to say much (but there's a lot of white space to use up). Conversely, some species with multiple illustrations, such as the Long-tailed Jaeger, need more writing but don't have the space for it. Hence the information content from species to species is uneven. Some accounts are notably terse, while others have been padded with filler, and both extremes read poorly. A logical approach to such a handbook would have been to give the writers guidelines on content (which was done), standardize the content by editing (which was not really done), see how many pages it came to, and then work on the page-spreads from there.

Beyond the simple differences in word counts, the content for different species accounts often reflects the interests or expertise of different authors, such as molts and plumages versus status and distribution. For example, the accounts of the ibises of the genus *Plegadis* (pp. 123–124) give no indication of how to distinguish first winter/first summer birds from adults (or from juveniles!)—certainly something a curious observer might wish to know and more useful for field identification (the book's purported focus) than information on population status (interesting but tangential). The second-summer Black-crowned Night-Heron is described but the second-summer Yellow-crowned is not. The schedule of wing molt is not mentioned for any swallow, though it is useful for identification in North America. The differences in the flight styles of the Common and Antillean Nighthawks are not described. Anyone hoping to identify the ages of nightjars has no hope; for example, see the Whip-poor-will account. The juvenile Poorwill is said to be similar to something, but to what is unclear. The fallacious dogma of wood-pewee mandible color is repeated uncritically (the Western averages darker but often has an all-pale mandible). And so on. But exact dates are given for the rarest vagrants—is such detail really in tune with the book's goal? Did the Greater Sandplover really arrive in California on 29 January, and the Masked Tityra in Texas on 17 February?

As for copy-editing or proof-checking, apparently there wasn't time to do this properly. Pick almost any page and you'll find slips, and often a syntax-defying sentence. Under the Whooping Crane the first and last sentences of the identification section are the same (p. 174). The Mallard is called the "Mallard Duck" (p. 19). Some gulls are "4-cycle" species, others "4-year" species (synonyms, but standardized use of one term or the other would prevent confusion). The illustrations of the Greenish and Caribbean Elaenias are switched (p. 380). The text for the Sage Sparrow (p. 575) says the "white supraloral does not extend beyond eye" (but then it wouldn't be a "supraloral"), yet the white brow does extend at least weakly past the eye in both the painting and photo of subspecies *nevadensis*, which is perhaps what was meant but erroneously misstated). And so on.

Other statements are more subjective, such as the description of the call of the Western Tanager (p. 558) as "very different" from that of the Summer but "indistinguishable" from that of the Flame-colored (whose call is considered "virtually indistinguishable" from that of the Western), yet differences in calls of western and eastern Summer Tanagers are not discussed, and I find all these calls quite similar. Do these comparisons really help the average birder, let alone the novice?

Many photos are stunning and well used, but others were poorly chosen, such as those portraying the Royal and Elegant Terns, which make these species look too similar. Could a photo of the two species together be that difficult to find? "Sorry, no time to look." And the photo labeled as an Indigo Bunting (p. 605) appears to be of a juvenile Lazuli.

Books crammed with this much information are predisposed to such errors, but more time given to production and editing could have greatly decreased the sloppiness that marks the book throughout. If NGS really cared about the user, it would have allowed more time for the book to be planned and executed. Yes, it might say, but this is a first edition, and we plan to print updates and improve as we go—and we'll make more money each time we do that. Great, and tell this to the thousands of trees that died for this edition. This "Microsoft approach" to bird-book publishing by NGS is being criticized elsewhere, as with a review in Finland of the 4th edition of the NGS *Field Guide to Birds of North America* (*Alula* 11:92, 2005). Why not "do it right" the first time?

Of course, if the world were perfect we human beings wouldn't be here. So what if this book, like the NGS field guides, was pushed out under unreasonable deadlines? It's all about marketing. After all, if thousands of people can be shown a few seconds'

blurry video of a Pileated Woodpecker and be convinced that it's an Ivory-billed Woodpecker, then the sky's the limit. Image rules over content. Publishing is just one microcosm of humanity—why should it be different from the others?

We can end by asking "Who benefits from CBNA?" NGS or the consumer? There really is a lot of good information in the book—just don't be surprised by the slap-dash production, which typifies the NGS "work ethic." So should you buy this book or wait a few years for an (inevitable?) second edition that has (a few) better plates? Well, that's up to you.

Steve N. G. Howell

FEATURED PHOTO

APPARENT EASTERN BELL'S VIREO IN SAN FRANCISCO

JIM GREAVES and LARK CHADWICK, 2416 De la Vina St., Santa Barbara, California 93105

JOSEPH MORLAN, 1359 Solano Dr., Pacifica, California 94044

Bell's Vireo (*Vireo bellii*) has four recognized subspecies: *V. b. bellii*, which breeds from eastern Colorado east to the Mississippi River and south to central Texas and Tamaulipas; *V. b. medius*, which breeds from southwestern Texas south to Durango and Coahuila; *V. b. arizonae*, which breeds from the Colorado River east through Arizona and south to Sonora; and *V. b. pusillus*, the Least Bell's Vireo, which breeds in California and northwestern Baja California (AOU 1957, Brown 1993, Unitt 1985, Pyle 1997).

Most California records of Bell's Vireo refer to either *pusillus* or *arizonae*. We report here a bird showing characteristics of one of the other eastern subspecies, probably nominate *bellii,* in San Francisco.

On October 30, 2005 Emilie Strauss along with Mike McClaskey, Steve Hayashi, and Lillian Fujii found a vireo they were unable to identify in the McClaren Rhododendron Dell in Golden Gate Park, San Francisco. They alerted Alan Hopkins, who tentatively identified it as an eastern Bell's Vireo (probably *V. b. bellii*), an opinion shared by many subsequent observers. The bird remained until 28 November 2005 when last reported by Pat Greene (Armstrong 2005, Glover et al. 2006).

Morlan visited the site 31 October 2005 and obtained digiscoped images, one of which has been posted at http://fog.ccsf.edu/~jmorlan/bevi311005.htm. The bird was reportedly heard singing on 5 November by Dennis and Patricia Braddy, suggesting it was a male (also, see discussion below). On 12 November, Leslie Lieurance was able to obtain video of the bird documenting its hyperactive wing-flicking and tail-pumping. His video has been posted at http://www.petrels.com/bevi.htm.

On 21 November 2005, Greaves and Chadwick were able to photograph this bird (see back cover). At first, they were unable to locate it even while intermittently playing the song of a Least Bell's Vireo through a small digital voice recorder (Panasonic RR-QR100). A few minutes after they quit looking for it and were wandering back toward the street, however, they heard the bird scolding about 100 feet to the south, only a few minutes after having passed that spot. The scolds came from the evening primrose (*Oenothera* sp.) and patch of other low shrubs and weeds in the dell's center, where others had seen the vireo. They watched it forage in blackberry and other native and non-native plants. Eventually the bird posed peacefully in the evening primrose in full sun, where its behavior was readily apparent: wing flipping, tail wagging, and fluttery flights that seemed to flow from the wing-flips as it hunted between perches. This behavior, and the bird's colors, far brighter than any Bell's Vireo Greaves had seen in 25 years of close contact with *pusillus*, convinced him that the identification of the bird to an eastern race was correct.

During his observation, Greaves noted that the bird foraged mostly within 4 feet of the ground and often landed on the ground among the *Oenothera* stalks. His notes taken at the time indicated that in comparison to a Least Bell's Vireo the bird had

- A shorter tail (probably at least 10 mm shorter than in *V. b. pusillus*, whose tail measures 47–54 mm; Pyle 1997)
- A larger bill (longer and deeper than in *V. b. pusillus*) pale flesh in color (compared to dark blue-gray in *V. b. pusillus*)

- Much brighter and more extensive yellow on the flanks
- Extensive greenish on back.

Its behavior, with wing-flipping, was much like a kinglet's. The tail wagging was not so much side to side as in *pusillus* but more up and down and not as rapid. Thus, although *pusillus* wags its tail a lot, like a gnatcatcher, this bird flipped its wings like a kinglet.

This was only the second Bell's Vireo not *pusillus* that Greaves had seen in California, the other being a wintering bird in Goleta (see below) that was thought to be of the Arizona or one of the eastern races. His recollection of that bird was that it did not flip its wings like a kinglet; on this basis it was probably *arizonae*.

Greaves's experience with Bell's Vireo began in Santa Barbara County, where he was part of a team that discovered and subsequently studied a population breeding inland at 1400 feet elevation in the Los Padres National Forest in 1978. None of the birds he has seen in that region, extending into Ventura County, were as bright as the one at Golden Gate Park, including fresh immatures after their molt out of juvenile plumage. Even in fresh plumage *pusillus* is gray and white, showing only a vague tinge of olive on the back and rump and only a hint of yellow on the sides of the breast and along the outer edges of the primaries and secondaries when the light hits them right. These relatively bland characteristics distinguish *pusillus* clearly from the other subspecies during the fall and winter.

From the bird's first response and subsequent behavior, Greaves was fairly confident that it was a male, but he never heard it sing. It is possible that, if it were a bird of the year, it might have responded to tape playback regardless of sex. In addition, there are rare instances when a female may sing, if however weakly or odd sounding, so what may resemble singing might not confirm the bird's sex in fall or winter. For example, on 31 May 1981 Greaves made a recording of a female *pusillus* issuing forth with five "songs" near a nest with chicks (she sang three times again on 11 June 1981). Her utterance flowed from rapid scolding and resembled the juveniles' practice songs, given usually after the fifth week from fledging. Greaves has heard such juvenile vocalizations a few times over the years, and from two adult females near nests.

Photos were made with a Nikon D70 digital SLR through a Sigma 400-mm macro auto-focus (non-digital) lens set to manual focus. Sunlit exposures were f-8 at 0.002 second at ISO 200; Greaves used a Vivitar 285H zoom flash wherever possible for highlights or when the bird was in shade. More photos may be seen at http://mysite.verizon.net/res1uzgs/Bells_Vireo.html.

As pointed out by Unitt (1985), the identification of eastern Bell's Vireo in California is confounded by bright examples of *arizonae* in fresh plumage. Furthermore there is a cline from the drabbest and grayest birds in the west (*pusillus*) to the brightest and greenest in the east (nominate *bellii*). Western birds average longer-tailed with little overlap between *pusillus* and *arizonae* in the west and *bellii* in the east (Ridgway 1904; Pyle 1997).

Although we feel it very likely that the San Francisco bird represents *bellii*, it may not be possible to rule out completely a bright example of *medius*. David Sibley provided us with photographs of three specimens of *medius* in fresh plumage in direct comparison with three of nominate *bellii* taken at the same season (September), preserved in Harvard University's Museum of Comparative Zoology. He also sent photographs comparing three spring specimens of *medius* with three spring specimens of *arizonae*. It appears from these photographs that *medius* is not exactly intermediate but closer to *arizonae* in coloration. These specimens of *medius* lack the more intense green on the back and yellow on the sides of the breast evident in the San Francisco bird.

Sibley also pointed out a possible difference in behavior that agrees with our observations. California *pusillus* wags its tail sideways like a gnatcatcher, while nominate *bellii* usually pumps its tail vertically like a Palm Warbler (*Dendroica palmarum*).

Further study is needed to confirm these behavioral differences, however, as they are based on relatively few observations. The apparent difference in wing-flicking also deserves further study.

We agree with Unitt (1985) that many California sight records thought to be eastern Bell's Vireos are probably based on fresh-plumaged examples of *arizonae*. Without high-quality photos and detailed study, however, it is difficult to evaluate these sightings. We therefore make no judgment as to the validity of previously published reports. However, we are aware of at least seven other reports of apparent eastern Bell's Vireos from California, as follows.

Richardson et al. (2003) noted two individuals on Southeast Farallon Island 15–18 September 1993. The published photo by J. Kaplan includes a caption which states, "This one appears too green to have been the California subspecies." The caption reference to 1992 was a typographical error, as the birds were in 1993 (R. Burnett, P. Pyle pers. comm.).

Lehman (1994) noted sightings of a bright individual suggesting a "different race" at Gaviota State Beach 16–17 October 1984 and another "probably not *V. b. pusillus*" wintering in Goleta 22 January–8 March 1981 and returning 16 October 1981–15 February 1982 (see Greaves's comments on this bird above).

Hamilton and Willick (1996) noted two fall records from Orange County with plumage suggesting "one of the more colorful eastern races, *V. b. bellii* or *V. b. medius*." One was at Huntington Beach 21 September 1992, the other at Huntington Central Park 28 October 1995. Jim Pike (pers. comm.), who saw both birds, stated that his notes on the 1995 bird strongly suggest an identification of *V. b. bellii*, as the bird had a "yellow-green" back, extensively yellow underparts, and a notably short tail. He also felt that the bill looked thicker than on the Least Bell's Vireos that he studied at the Prado Basin.

Unitt (2004) referenced a sighting at Point Loma 10 October 1988 of a Bell's Vireo thought to be of the nominate race, adding that this green extreme of the species is "likely in California as a rare vagrant but has not been confirmed with a specimen or photograph." With publication of the photo featured on this issue's back cover, we take a step toward remedying this uncertainty.

We thank David Sibley for providing previously unpublished information and analysis and Ryan Burnett of Point Reyes Bird Observatory for additional information. This note benefited from the input of many other colleagues and observers who provided opinions on the subspecies of this bird during the course of its stay.

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Thanks again for your support in making *Western Birds* more available and useful. Happy viewing!

W. David Shuford

IN MEMORIAM

HOWARD L. COGSWELL, 1915–2006

Dr. Howard L. Cogswell, distinguished field ornithologist, ecologist, author, mentor, teacher, friend of the environment, and long-time member of Western Field Ornithologists, died on 8 June 2006 at the age of 91. Born on a farm in Susquehanna County, Pennsylvania, in 1915, Howard began his passion for birds as a child when he read books by Thornton W. Burgess, especially his *Bird Book for Children*. When he was about ten he discovered birds as a hobby in the *Handbook of Birds* by Frank M. Chapman and *The Book of Bird Life* by Arthur A. Allen. He hitchhiked to southern California in 1931, took various jobs, and married his landlady's daughter, Bessie Wilby, in 1938. He familiarized himself with the chaparral and its birds by riding his bicycle into the San Gabriel Mountains from his home in Pasadena. His extensive and detailed notes are well known. In 1944 Joseph Grinnell and A. H. Miller acknowledged him and only five others as those whose "manuscript notes have been most extensively used and cited" in *The Distribution of the Birds of California*. He was a postman when he enlisted in the navy and was sent to the Pacific during World War II, where he served in the V-Mail service. Other sailors in his unit called him "feather funny" because of his interest in birds. His first published article, "Summer Observations of Birds on Okinawa, Ryukyu Islands," appeared in the *Condor* (50:16–25). Taking advantage of the G. I. Bill, he received his bachelor's degree from Whittier College in 1948 and his master's in 1951. Because of his expertise on chaparral and its birds he was asked to write the chapter on chaparral in *The Bird Watcher's America*, edited by Olin Sewall Pettingill, Jr. (1965).

Howard received his Ph.D. from the University of California, Berkeley, in 1962, with his dissertation "Territory Size of Three Species of Chaparral Birds in Relation to Vegetation Density and Structure." While completing his Ph.D. he taught at Mills College in Oakland. My sister was a student at Mills at the time, and she introduced me (John Luther) to Howard while I was a student in high school. He invited me to join him on Audubon field trips. I still remember our excitement when Howard showed me my first Saw-whet Owl on one of those trips. He mentored me in those developing years as a birdwatcher and then later as head of my M. A. committee at California State University, Hayward. I know that many others also remember Howard's introducing them to the exciting world of birds.

Rich Stallcup grew up in Oakland while Howard was teaching at Mills. Rich recalls, "as a very little boy, I would bring him snakes from neighborhood vacant lots to his lab at Mills College, and in exchange he would tell me stories from the field of birds or teach me techniques like the preparation of study skins. Later in life how exciting it was to ride in his airplane trying to census gulls while in a power-dive as he, the pilot, is sifting through a handful of 3 × 5 cards to find out if we were or were not in restricted airspace."

In 1964 Howard joined California State University at Hayward as a professor in biological science. While at CSUH, and as an emeritus professor after his retirement in 1980, he worked with many students on their master's degrees specializing on San Francisco Bay area habitats and birdlife. Chris Swarth received his M. S. in 1983

working with Howard Cogswell. Chris said of Howard, "he really enjoyed teaching and had a great interest in all aspects of natural history. His special love seemed to be south San Francisco Bay aquatic habitats, especially the bay mudflats and the salt ponds." Howard was an elected director of the East Bay Regional Park District from 1970 to 1982 and was the main driving force behind the development and preservation of many of the east bay area's shorelines. Cogswell Marsh in the Hayward Regional Shoreline, operated by the East Bay Regional Park District, was dedicated to him. The plaque at the marsh says of Howard, "he has played an instrumental role in the planning and creation of this park and continues to conduct and inspire research studies along this shoreline. Through his vision, knowledge and dedication, this restored wetland became a reality for all to enjoy."

Although Howard rarely strayed far from his beloved California, in March 1980 he did venture to Venezuela on a birding tour with former graduate student Rose Ann Rowlett. Rose Ann recalls how Howard showed up "having prepared for the birds with the thoroughness he had tried to teach me, his field guide massively annotated and color-coded as to status and distribution, habitat, and elevation for each species. While serving as a handy reference for the whole group, his elaborate annotations were almost superfluous given how much of it he absorbed in the process—a remarkable amount for a newcomer to 'The Bird Continent.' After all he had shared with me, it was a delight to witness his pleasure on encountering flamingos, Hoatzins, and enormous mixed-species flocks."

Howard Cogswell was an active bird bander and life member of the Western Bird Banding Association, serving as its vice-president 1954–57 and president 1957–59. He helped establish Point Reyes Bird Observatory in 1965 and served on the first board of PRBO. C. J. Ralph recalls, "Howard was a mentor for me in my early years of banding. He took Rich Stallcup and me on many of his field trips when we were in our early teens and was supportive of our adventures over the years. As a board member of WBBA, he was one of the WBBA members that really made PRBO happen." He was also instrumental in establishing the San Francisco Bay Bird Observatory.

In 1940 Howard became a member of the Cooper Ornithological Society and in 1986 he was voted an honorary member. Honorary membership is "conferred on members of the society who have rendered outstanding service to the society." He became a member of the American Ornithologists' Union in 1944 and an elective member in 1952. He was an honorary fellow of the California Academy of Sciences, a member of the Wilson Ornithological Society, the Association of Field Ornithologists, and the Waterbird Society. In 1966 he was a leader in founding and establishing the Ohlone Audubon Society. He led their first field trip, established their Christmas bird count and, continued to be active in Ohlone Audubon until his death. Howard was the scientific advisor and the inspiration behind the Alameda County breeding bird atlas (in preparation), assembling a large team of former students and those he knew through Audubon to do a thorough breeding bird atlas of the county he lived and worked in. He was the author of *Water Birds of California*, published by the University of California Press in 1977, and many articles and bird surveys concerning San Francisco Bay birds and habitats.

Howard Cogswell served as treasurer/membership chair of Western Field Ornithologists from 1988 to 1992. He set up our first electronic database to track our members. His latest contribution to *Western Birds* was his 2001 review of *The California Condor: A Saga of Natural History and Conservation* by Noel and Helen Snyder.

The enthusiasm, drive, and commitment to teaching and to saving the environment that Howard Cogswell always demonstrated and shared with his friends and his students will be missed by us all. First and foremost, we shall all remember his passion as a field biologist and the joy of sharing days in the field with him.

John S. Luther and Phil E. Gordon

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EFFECTS OF A CHANGING ENVIRONMENT ON NESTING SNOWY PLOVERS AT OWENS LAKE, CALIFORNIA

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ABSTRACT: Fourteen lakewide surveys for breeding Snowy Plovers (*Charadrius alexandrinus*) have been conducted at Owens Lake over three decades. There was a steep decline from 499 adults on the first survey in 1978 to 195 on the second in 1988. Nine subsequent counts from 1990 to 2001 varied from 101 to 203 adults (mean 138, standard error 11). After the introduction in 2002 of water to large areas for dust control, numbers of adults increased annually to 658 in 2004. Shallow flooded areas now account for 85% of the adults. The distribution of nests has also changed since the addition of water. The area of most extensive shallow flooding accounted for 71% and 61% of the nests found in 2002 and 2003, respectively, compared with only 27% in the area in 2001 prior to flooding. The nesting season has also been extended by about a month since the plovers began nesting in flooded areas. At Owens Lake Snowy Plovers have benefited from the shallow flooding for dust control but are now more dependent on man-made habitat.

In western North America 10,000–20,000 Snowy Plovers nest at interior alkaline lakes, on Pacific beaches, and in man-made evaporation ponds (Page and Stenzel 1981, Herman et al. 1988, Page et al. 1991, Palacios et al. 1994, Page et al. 1995). After the U.S. Fish and Wildlife Service designated the Pacific coast population as threatened in 1993, breeding Snowy Plovers were monitored at many coastal sites (Powell et al. 2002, Ruhlen et al. 2003, Neuman et al. 2004) but at few interior ones (Shuford et al. 2004). One of the few inland sites of regular censuses is Owens Lake, where we have counted breeding plovers annually since 1994 and have located their nests from 1999 to 2003.

Fisher (1893) provided the earliest account of the Snowy Plover at Owens Lake during the breeding season, describing it as "common" in small flocks of 5 to 10 on alkaline flats bordering the lake near Keeler, 30 May to 4 June 1891. He believed the plovers were breeding there even though he found no eggs or young. Tom and Jo Heindel were the first to confirm

breeding at Owens Lake, noting 130 adult-sized plovers accompanied by downy young in July 1975 (McCaskie 1975). The first lakewide survey for breeding Snowy Plovers recorded 499 adults in 1978 (Page and Stenzel 1981). Follow-up surveys in 1988 and 1990 documented only 195 and 141 adults, respectively (Page et al. 1991, this paper).

Small populations of birds living in environments subject to human alterations are susceptible to the effects of habitat changes and hence should be monitored to ensure these changes do not jeopardize their viability. In particular, human alterations may affect the carrying capacity of the habitat, nesting behavior, or reproductive success, to the benefit or detriment of the species. The Owens lakebed has been subject to major alterations since 2001 resulting from a 1998 agreement between Los Angeles Department of Water and Power (LADWP) and the Great Basin Unified Air Pollution Control District (GBUAPCD) to control the dust that blows from the dry lakebed. Dust-control measures, intended to bring the region into compliance with federal air-quality standards, include shallow flooding of sizable portions of the lakebed. The first area to be flooded was inundated in winter 2001–02; three additional ones followed in winter 2002–03. This addition of water to large areas of formerly dry lakebed has substantially altered breeding habitat for Snowy Plovers at Owens Lake. Here we report the effects of shallow flooding on the total numbers, distribution, duration of breeding season, and nest placement of Snowy Plovers at Owens Lake.

STUDY AREA AND METHODS

Owens Lake is the remnant of a large prehistoric freshwater lake 1128 m above sea level at the western edge of the Great Basin desert in Inyo County, California. In the early 1900s, it covered about 280 km^2 but since the late 1920s it has been essentially dry, except for limited spring inflow, because of diversion of the Owens River and tributary streams by the city of Los Angeles. As the lake evaporated, dissolved minerals in the water crystallized into the alkali crust now covering most of the lakebed. The remaining wet areas are small isolated springs or seeps originating from underground water sources, the Owens River delta, and a brine pool in the center of the lake. The flow of these seeps onto the lakebed, or lack thereof, varies both annually and daily, particularly during the hot summer.

The region is typically hot and dry in summer and cold in winter and spring, with periods of high winds. From 1971 to 2000 maximum temperatures in the nearby town of Independence averaged 28° C in May, 33° C in June, 37° C in July, 36° C in August, and 13° C in both December and January (Western Regional Climate Center, http://www.wrcc.dri.edu/index.html). Average minimum temperatures ranged from 11° to 18° C from May to August and were lowest in December and January at –2° C. Average annual precipitation was 13.2 cm with monthly averages ranging from 0.3 to 0.5 cm during the spring and summer (Western Regional Climate Center, http://www.wrcc.dri.edu/index.html).

The most obvious anthropogenic effect on the habitat during the past three decades is the large release of water onto the lakebed. This occurred on the 1978 survey when water flowed on the lakebed from four creeks on

the west side (Henderson and Page 1979) and from 2002 to 2004 with the spraying of water piped underground from the Los Angeles Aqueduct to flood extensive areas to reduce wind-driven dust. By summer 2004, 40.8 km^2 of shallowly flooded habitat were included within zones 1 and 2 and phases 1 and 2 (Figure 1).

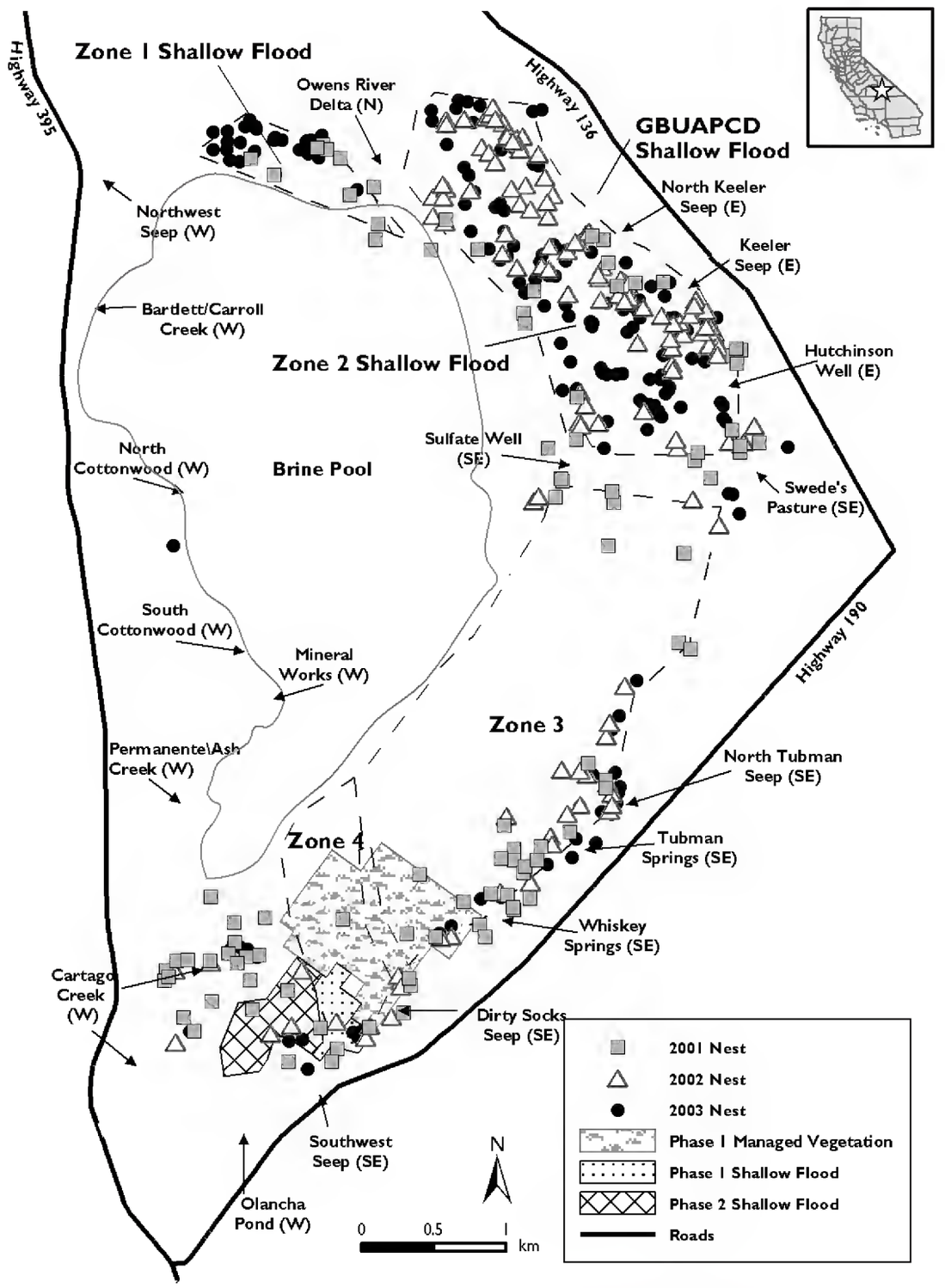

Figure 1. Survey locations and 2001–2003 distribution of Snowy Plover nests at Owens Lake. Regions of the lakebed are west (W), north (N), east (E), and south/southeast (SE).

The flooded areas consist of shallow ponds, mudflats, and dry alkali crust, surrounded and subdivided by roads and berms. In 2002, as a by-product of furrows dug with farm equipment to channel water, the bottom of much of Zone 2 was covered with ridges 0.02 m to 0.36 m high, and the birds used them as nest sites. Zone 1 and phases 1 and 2 were leveled prior to flooding to yield more evenly wet terrain, but the water cut channels and created dry alkali-crusted islands which provided abundant nest sites. By 2002, berms up to 1 m high were being constructed within zones 1 and 2 to increase ponding. These berms were also used as nest sites. Within a portion of Phase 1, 46 rectangular gravel islands of 193 m^2 each were constructed to provide plover nest sites. Water depth within the flooded areas ranged up to about 1 m, in areas where it collected in ponds for recycling. In 2002, the depth of water nearest nests averaged 0.037 m (standard error [SE] = 0.00, n = 68) versus 0.054 m (SE = 0.01, n = 35) at randomly selected points within Zone 2. Salinities in late May 2003 varied from 4 to 64 parts per thousand (ppt) in zones 1 and 2, 88 to 113 ppt in Phase 1, and 298 to 313 ppt in Phase 2 (CH2M Hill unpubl. data).

We divided the lakebed into west, north, east, and south/southeast survey regions that included natural seeps or (after 2001) artificially flooded areas where plovers were likely to congregate (Figure 1, Table 1). The west region included eight seeps; the north region the Owens River delta and, beginning in 2003, the 4.8-km^2 Zone 1 flooded area; the east region three natural seeps encompassed within the 31.0-km^2 Zone 2 flooded area by 2002; and the south/southeast region seven natural seeps and later the 1.6-km^2 Phase 1 and 3.4-km^2 Phase 2 flooded areas. Phase 1 was partially flooded in 2002 and, with Phase 2, was fully flooded by 2003.

The surveys for adult Snowy Plovers were conducted mid-nesting season 14 times from 1978 to 2004 (Page and Stenzel 1981, Page et al. 1991, Table 1). Surveys lasted up to 8 days (severe weather or dust storms aborted field days in some years), except in 1978, when 14 days (25 May–7 June) were required to familiarize surveyors with the lakebed's geography, to develop a survey protocol, and to conduct the survey. After 1978, ten surveys were conducted from 19 to 31 May, two from 9 to 17 May, and one from 3 to 7 June. Coverage was the same each year except for the Owens River delta (usually dry by late May), which was surveyed only twice prior to 2001 because of difficult access; Whiskey Springs and North Tubman seeps, small areas with large seasonal fluctuations in water availability which were not surveyed regularly until 2002; Swede's Pasture not until 1996; Southwest Seep not until 1995; and Olancha Pond any year it was completely dry (Table 1). Keeler Seep, not surveyed until 2001, was subsequently encompassed within the Zone 2 flooded area, as were Hutchinson Well and North Keeler Seep. The 1.8-km^2 GBUAPCD flooded area, a small experimental test site, was surveyed in 2000, the only year it was present.

One or two people, with binoculars and 20–60× spotting scopes, surveyed wet areas within each region for plovers, usually during early morning or evening hours when visibility was best. When possible, adjacent sites were covered on the same or consecutive days. Surveyors walked through or adjacent to large natural seeps, stopping every 100 to 300 m to scan shallow water and surrounding alkali flats for adults and broods. To cover

Table 1 Number of Adult Snowy Plovers on Surveys of Owens Lake, 1978–2004

	Year						
Location	1978	1988	1990	1994	1995	1996	1997
West shore							
Northwest Seep	33	2	5	5	20	7	12
Bartlett/Carroll Creek	42	20	24	4	1	23	11
North Cottonwood	17	24	6	21	18	37	26
South Cottonwood	33	8	17	20	25	43	32
Mineral Works	16	1	1	0	3	0	2
Permanente/Ash Creek	67	47	33	19	9	3	23
Cartago Creek	115	0	0	52	17	11	25
Olancha Pond	12	18	0	0	2	0	0
Subtotal	335	120	86	121	95	124	131
South/Southeast region							
Sulfate Well	37	6	8	0	1	8	21
Swede's Pasture	0	NS[c]	NS	NS	NS	0	16
North Tubman Seep	NS	NS	NS	NS	NS	NS	NS
Tubman Springs	11	6	8	0	3	1	3
Whiskey Creek	NS	4	NS	NS	NS	NS	NS
Dirty Socks	88[d]	40	27	4	15	18	10
Southwest Seep	NS	3	2	NS	5	0	0
Phase 1 shallow flood	NH	NH	NH	NH	NH	NH	NH
Phase 2 shallow flood	NH	NH	NH	NH	NH	NH	NH
Subtotal	136	59	45	4	24	27	50
East shore							
North Keeler Seep	15	1	0	NS	0	0	4
Keeler Seep	NS	NS	NS	NS	NS	NS	NS
Hutchinson Well	13	15	10	0	0	0	9
GBUAPCD flood	NH	NH	NH	NH	NH	NH	NH
Zone 2 shallow flood	NH	NH	NH	NH	NH	NH	NH
Subtotal	28	16	10	0	0	0	13
North shore							
Owens River delta	NS	NS	NS	NS	NS	9	9
Zone 1 shallow flood	NH	NH	NH	NH	NH	NH	NH
Subtotal	0	0	0	0	0	9	9
Total adults	499[f]	195[g]	141	125	119	160	203

[a]SE, standard error.

[b]NH, no habitat suitable for the Snowy Plover at the time of survey.

[c]NS, area not surveyed.

[d]26 of the 88 adults were in a pond on the south side of Highway 190 that has not been present on subsequent surveys.

[e]Z2, seep encompassed within Zone 2 after flooding, thus indistinguishable.

[f]1978 survey totals previously published (Page and Stenzel 1981).

[g]1988 survey total previously published (Page et al. 1991).

Year								
1998	1999	2000	2001	2002	2003	2004	Mean	SE[a]
5	3	6	5	2	3	4	8	2
6	9	16	6	3	14	1	13	3
16	14	5	6	15	18	24	18	2
8	18	15	10	28	6	16	20	3
0	0	0	0	0	0	0	2	1
0	6	0	8	4	0	13	17	5
27	4	2	23	4	17	20	23	8
0	0	0	0	0	NH[b]	NH	3	2
62	54	44	58	56	58	78	102	20
6	20	19	33	12	16	6	14	3
6	13	5	21	0	5	0	7	2
NS	NS	NS	NS	3	6	3	4	1
6	5	2	16	14	7	5	6	1
NS	NS	NS	NS	4	3	2	3	0
16	24	16	20	6	0	6	21	6
0	0	2	0	2	0	0	1	0
NH	NH	NH	NH	6	11	48	22	13
NH	NH	NH	NH	NH	0	4	2	2
34	62	44	90	47	48	74	53	9
0	2	3	0	Z2[e]	Z2	Z2	3	1
NS	NS	NS	7	Z2	Z2	Z2	7	0
5	0	13	8	Z2	Z2	Z2	7	2
NH	NH	8	NH	NH	NH	NH	8	0
NH	NH	NH	NH	152	224	325	234	50
5	2	24	15	152	224	325	58	27
NS	NS	NS	4	17	20	0	10	3
NH	NH	NH	NH	NH	51	181	116	65
0	0	0	4	17	71	181	21	13
101	118	112	167	272	401	658	234	45

large shallow flooded areas, observers walked parallel transects 250 to 500 m apart through wet mud, stopping to scan for plovers every 100 to 300 m. We covered small flooded areas by driving perimeter roads, stopping to scan for plovers every 100 to 300 m. Observers communicated with radios to ensure plovers between them were not double counted. Zone 2 required two to seven consecutive days to complete because of its large size and difficult terrain, while other areas required only one day. At small natural seeps, stationary observers scanned the outflow and surrounding flats every 5 to 10 minutes for about an hour, typically just before dusk. The maximum number of adults and broods seen during a scan was used

as the count for the area. To detect broods, observers looked for specific behavior of adults—particularly males standing alert, head bobbing, calling, or performing distraction displays—and watched from a distance for up to 20 minutes until chicks appeared. Broods may have been more detectable at natural seeps, where observers stood in one location for longer periods, than in artificially flooded areas, where chicks, especially larger ones, could run ahead of walking observers to avoid detection.

We found nests by searching for lone females or pairs and watching them from a distance for up to an hour until they returned to a nest or scrape. Nest searches were undertaken every seven to ten days from April through August in all dust-control areas in the east and south/southeast regions of the lake from 2001 to 2003, in the north region in 2001 and 2003, and within 1 km of natural seeps in the east and south/southeast regions and at Cartago Creek in the west region from 2001 to 2003. We also searched dry alkali areas away from seeps in the south/southeast region about once per month from April through June from 1999 to 2003. Our effort at nest searching was consistent from 2001 to 2003 but not in 1999 and 2000 when fewer full-time observers targeted limited areas. We used the global-positioning system (GPS) to map the coordinates of all nests, and we floated the eggs of complete clutches to estimate nest-initiation date. From 1999 to 2002, we estimated nest distance to water visually and by pacing, or by calculations from two GPS coordinates; when possible, we measured small distances with a meter stick.

Because water, with its associated invertebrate prey, is important to the quality of Snowy Plover nesting habitat, we examined the effect of local precipitation on the number of plovers on annual surveys. We then compared the total number of plovers in the four years of water releases with the ten years in which no water flowed onto the lakebed.

RESULTS

Abundance and Distribution of Adults

Numbers of Snowy Plovers at Owens Lake declined sharply from 499 adults in 1978 to 195 on the next survey in 1988 (Table 1). From 1990 to 2001, numbers ranged between 101 and 203 (mean = 138, SE = 11), then increased to 272 in 2002, 401 in 2003, and 658 in 2004 (Table 1), in concert with the commencement of flooding in 2002. Artificially flooded areas accounted for 58% of the birds detected in 2002, 71% in 2003, and 85% in 2004. Once these areas were available, numbers of adults in the north and east regions increased steeply, while numbers in the west region remained relatively stable. Over a longer period, numbers of birds at seeps in the west region declined from an average of 113 (SE = 7) between 1988 and 1997 to 58 (SE = 4) from 1998 to 2004 (Table 1). The 335 adults recorded in this region in 1978 were many more than in any other year and higher than the lakewide totals in all other years prior to flooding for dust control (Table 1). In the south/southeast region numbers of birds at natural seeps varied markedly, from 4 to 90 (mean = 44, SE = 8) between 1988 and 2001, with a high of 136 in 1978 (Table 1).

Numbers of adult Snowy Plovers at Owens Lake were not correlated with local precipitation (Spearman rank correlation, $\rho = 0.297$, $P = 0.15$, $t = 1.076$, df = 12), but total numbers were greater in all years when water was released than in any years when no water was released (Wilcoxon test, $U = 55$, $P = 0.001$, Figure 2).

Nest Placement

There is no information on the Snowy Plover's nest placement at Owens Lake prior to the lake's drying. Of 21 nests located in 1978, 16 were close to creeks or seeps, 4 were on a small island in a flooded area south of Highway 190, and 1 was in a vehicle track on the alkali flats (Henderson and Page 1979). Of 11 nests close to creeks, 6 were at the edge of or in openings of patches of salt grass (*Distichlis spicata*) and 5 were on barren alkali flats (Henderson and Page 1979). Distances from water averaged 12 m (SE = 4) for island nests and 118 m (SE = 35) for all others (PRBO unpubl. data).

Nests found in natural areas in the north, east, and south/southeast regions of Owens Lake between 1999 and 2002 were scattered on open dry alkali flats. In 105 of 164 cases (64%), they were near distinctive features such as dry washes, sparse patches of salt grass, rocks, woody debris, unimproved roadsides, or vehicle tracks. In 2003, three nests were found within Phase 1 on gravel islands created specifically for plover nesting. After 2001, nest placement appeared to be strongly affected by the presence of artificially flooded areas. In 2001, before flooding, Zone 2 accounted for 27% of the

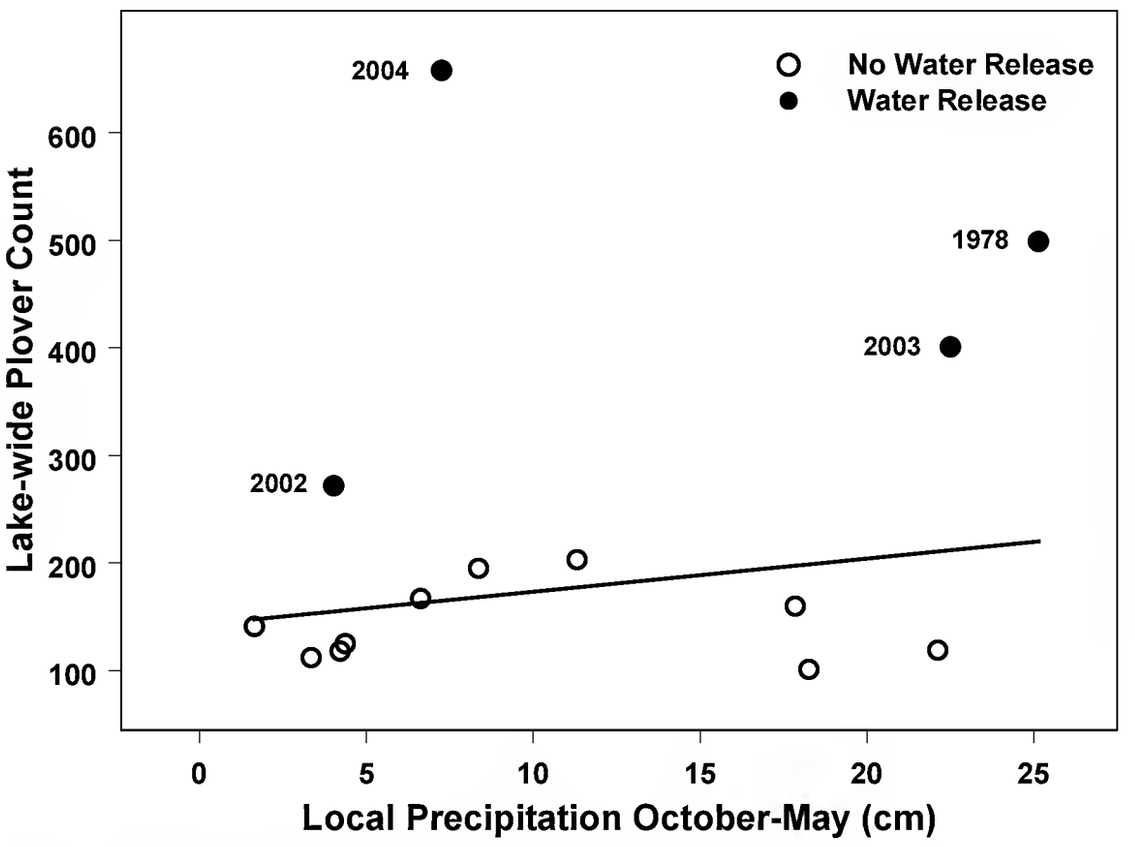

Figure 2. Relationship between numbers of Snowy Plovers, local precipitation rates, and large releases of water on the bed of Owens Lake.

98 nests found, whereas after flooding it accounted for 71% of 128 nests in 2002 and 61% of 199 in 2003 (Figure 1). In 2003, 80% of all nests we found were within the four artificially flooded areas (Figure 1). In 2002, distances of nests from water in natural areas in the east region, south/southeast region, and the Cartago Springs outflow averaged 425 m (SE = 72, n = 28), whereas in Zone 2 they averaged 8 m (SE = 1, n = 89). Prior to artificial flooding these distances averaged 468 m (SE = 83, n = 15) in 1999 and 379 m (SE = 38, n = 98) in 2001.

Abundance and Distribution of Broods

Like those of adults, numbers of Snowy Plover broods increased after flooding began in 2002. From 1988 to 2001, lakewide surveys averaged 14 broods (SE = 2) compared to 36 (SE = 2) from 2002 to 2004. Artificially flooded areas accounted for 45% of the lakewide total in 2002, 42% in 2003, and 72% in 2004. While most broods in flooded areas were probably from nests located within them, six broods were seen moving from the playa into Zone 2, and one brood from a nest in a managed vegetation plot moved into Phase 1. In late July 2003, when most natural sources of water were dry or significantly reduced in flow, all but 1 of 38 broods on a lakewide survey were in artificially flooded areas.

Phenology

The reflooding of the lakebed for dust control significantly extended the duration of the plover's breeding season at Owens Lake (Figure 3). Before flooding, or in natural areas after flooding began, few nests were initiated after the fourth week of May, whereas within the flooded areas over half the nests were initiated after the fourth week of May (χ^2 = 95, df = 2, P = 0.0). In 2001, 90% of 97 nests with known initiation dates had been initiated by the fourth week of May, as were an average of 92% of 75 nests in natural habitats in 2002 and 2003 (Figure 3). By comparison, in the artificially flooded areas an average of only 44% of 243 nests with known initiation dates had been initiated by the fourth week of May in 2002 and 2003 (Figure 3). In addition, prior to flooding, only 1% of the nests in 2001 were initiated in July, whereas in the flooded areas in 2002 and 2003 9% of the nests were initiated in July. The extension of the nesting season was likely not due to increased depredation rates because in 2002, when we checked nests in Zone 2 regularly, 86.7% of 90 clutches with known fates hatched (PRBO unpubl. data).

DISCUSSION

On the basis of regional surveys in 1978 and 1988 Page et al. (1991) identified Owens Lake as one of six key breeding sites for the Snowy Plover in the interior of California. The 499 adults on the 1978 survey coincided with large releases of water following a winter of heavy snowfall and was the highest count at any location. Despite smaller numbers after 1978, subsequent lakewide surveys demonstrated that Owens Lake continued to be an important breeding area for Snowy Plovers. From 1988 to 2001, in

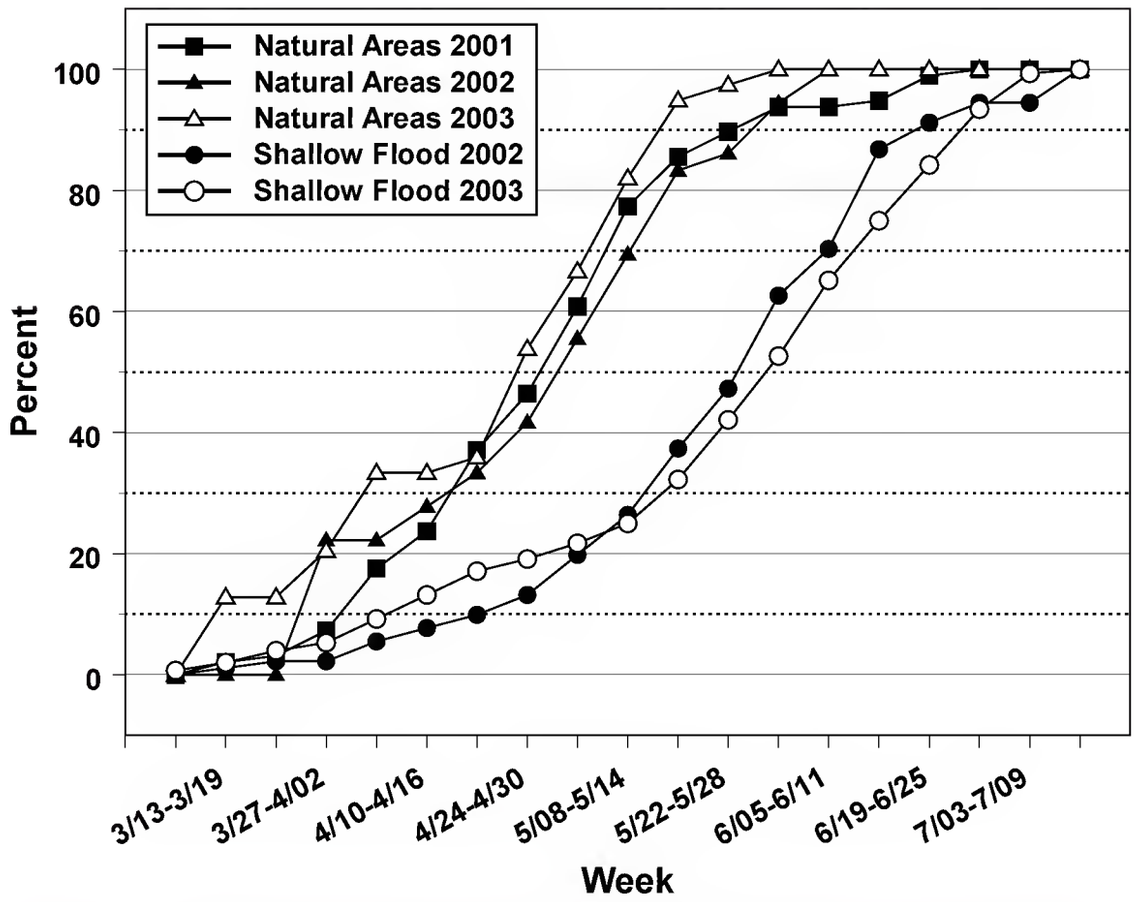

Figure 3. Cumulative percentage of Snowy Plover nests by initiation date. Numbers of nests were 97 in 2001, 36 in 2002, and 39 in 2003 for the natural areas, and 91 in 2002 and 152 in 2003 for the shallow flooded areas. See methods for more details.

the absence of large water releases, numbers of plovers varied from 100 to 200. Although annual local precipitation during that period varied by a factor of over 13, the variation was apparently insufficient to affect the number of breeding plovers. Flooding to reduce dust from 2002 to 2004 was accompanied by an immediate and sustained increase in plover numbers, suggesting that the creation of extensive shallow flooded areas was responsible for the rapid rise. The total of 658 adults in 2004 is to our knowledge the highest count for any location where the Snowy Plover breeds in California, coastal or interior.

While some plovers have probably been attracted to the new man-made habitat from other areas of Owens Lake, numbers in at least some natural areas, such as the west shore, have remained relatively stable during the period of lakebed alteration. The rates of increase in plover numbers at Owens Lake since initiation of flooding—63% from 2001 to 2002, 47% from 2002 to 2003, 64% from 2003 to 2004—are unlikely without emigration from other sites. An estimate of the number of young required for the population increases observed at Owens Lake, if it were a closed system with no emigration or immigration, and the annual survival rates were 0.50 for juveniles and 0.75 for adults (U. S. Fish and Wildlife Service

2001), can be estimated by solving for r_i from the equation $0.75 + 0.5r_i = n_{i+1}/n_i$, where r_i is the number of young fledged per adult in year i and n_i is the number of breeding plovers at Owens Lake in year i. The productivity necessary for the observed increases under these conditions is 1.8 young per adult (or 3.5–3.6 young per male) for the first and third intervals and 1.4 young per adult (2.9 young per male) for the second interval. These levels of productivity are likely quite a bit higher than the birds were able to achieve at Owens Lake, requiring population increases to be due in part to immigration from other areas

The source of the immigrating plovers is not apparent because of the absence of banded birds and the absence of comprehensive surveys of other inland nesting sites. At Mono Lake, 240 km north of Owens Lake, numbers on lakewide counts declined from 384 and 342 adults in 1978 and 1988, respectively, to 119 in 2001 and 98 in 2002 (Page et al. 1991, PRBO unpubl. data), during a period of shrinking shoreline nesting habitat as the water level increased. Without annual surveys at Mono Lake between 1988 and 2001, though, the timing and possible causes of the decline are uncertain (S. Heath pers. comm.). At the Salton Sea, 480 km south of Owens Lake, a count of 221 adults in late May 1999 (Shuford et al. 2004) was comparable to counts of 198 in 1988 and 226 in 1978 (Page et al. 1991). In the San Joaquin Valley the Snowy Plover population increased from fewer than 10 in the late 1970s to 241 in the late 1980s, paralleling the construction of 2870 hectares of evaporation ponds for agricultural waste water (Page et al. 1991, Roster et al. 1992). Subsequently, some ponds ceased operation and others were deliberately modified to make them less suitable for nesting because of a problem of excessive concentrations of selenium on nesting birds. We are uncertain how these changes have affected the Snowy Plover's numbers in the San Joaquin Valley as no comprehensive survey has been conducted since 1988.

The dust-control projects have created substantial new habitat for Snowy Plovers at Owens Lake. Since their initiation, numbers of adults and broods have more than doubled, nesting occurs nearer abundant food and water, and the nesting season lasts as long as on the coast (Warriner et al. 1986). The LADWP has spent millions of dollars implementing these projects and must continue to maintain them to be in compliance with federal air-quality standards. Almost constant irrigation of shallow basins requires large amounts of water—a scarce resource subject to many competing demands. Although protections to maintain minimum population levels of the plover are in place, as of 2004, the future of all but about 1000 acres (9.9%) of the 10,058 acres currently flooded is not guaranteed, as other less water-intensive methods of dust control may eventually prove more efficient. Snowy Plovers using artificially flooded areas at Owens Lake may be vulnerable not only to management changes over time but also to natural changes as the system evolves; for example, vegetation cover could increase in shallow flooded areas, reducing nesting habitat suitable for plovers. Continued monitoring of the plover population at Owens Lake will increase our understanding of the effects of continued dust control. Corresponding surveys of Snowy Plovers at other inland breeding sites would help identify intrinsic and extrinsic factors affecting future numbers of plovers at Owens Lake.

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Snowy Plover

Sketch by George C. West

A HISTORICAL PERSPECTIVE ON THE CITRUS-LIKE SCENT OF THE CRESTED AUKLET

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ABSTRACT: The tangerine-like odor produced by breeding Crested Auklets (*Aethia cristatella*) of both sexes has attracted considerable attention recently as researchers attempt to determine its function. Chicks and one-year-old immatures do not produce the odor. Even though the odor has long been known to the Yu'pik people of St. Lawrence Island, naturalists and ornithologists visiting seabird colonies on the Aleutian Islands and in the Bering Sea from the mid-1700s through first half of the 20th century did not mention the odor. I trace the steps of two early ornithologists, Charles H. Townsend and Ira N. Gabrielson, whose numerous visits to auklet colonies in the late 1800s and 1940s, respectively, provided opportunities to smell the scent. The odor was eventually described on the basis of specimens smelled during preparation and on the basis of encounters with the auklets at sea. The closely related Whiskered Auklet (*A. pygmaea*) also produces an odor, but its function requires study.

The plumage of both males and females of the highly social Crested Auklet (*Aethia cristatella*) exudes an odor like that of a tangerine. The odor is more intense during the breeding season (Douglas et al. 2001, Hagelin et al. 2003). During the stereotyped "ruff-sniff" courtship display (Figure 1), males and females rub their bills in turn in the feathers of the nape and neck of their displaying partners (Jones 1993, Jones and Hunter 1993, Hunter and Jones 1999). How the scent is produced is a mystery, but studies are elucidating its function. Observations and experiments suggest that these chemical signals serve "at least a general social function" (Hagelin et al. 2003, Jones et al. 2004:71) or that the constituents of the odor repel ectoparasites and, therefore, possibly signal a mate's quality (Douglas et al. 2001, 2004, 2005a, b; see Hirth 2005 for a popular account). Although the secrets of this scent are being unlocked now, it was not until the late 1950s that the scent was mentioned in the scientific literature, despite more than a century of exploration of the seabird colonies in the Bering Sea region by naturalists and ornithologists, many of whom must have detected the odor.

This odor aroused my curiosity when I initiated a study of the breeding biology of Parakeet (*A. psittacula*), Least (*A. pusilla*), and Crested auklets in 1966 and 1967 at a mixed colony near the village of Gambell on the Northwest Cape of St. Lawrence Island, in the northern Bering Sea (Sealy 1968). Jean Bédard had been studying ecological segregation among these auklets for two years and was familiar with the odor. We detected it readily at the colony and on the sea, sometimes before we saw the birds, in dense fog and when the wind blew toward us, or when it was calm. Our observations were by no means new, however, because the people of St. Lawrence Island had known about this odor for many generations. In the Yu'pik language, the word for auklets is *sukilpaq* and, with the suffix *-pagni* ("odor of"), *sukilpaqhpagni* becomes "odor of auklets" (David Shinen in litt., 13 April 2004). Elders and others in the village said that the return of Crested Auklets in spring to the waters near their colonies on St. Lawrence Island is heralded by this distinctive odor, which they detected at sea and on calm,

Figure 1. Crested Auklets engaged in the ruff-sniff display, Kitnik colony near Savoonga, St. Lawrence Island, 2 July 2004.

Photo by Lisa M. Sheffield

overcast days when it wafted through the village. I smelled the scent in the village the first day after my arrival in mid-May in the first year.

AUKLETS IN THE HAND

If the residents of St. Lawrence Island and undoubtedly elsewhere within the range of the Crested Auklet knew about this odor, and because it was so apparent to Bédard and me, it is puzzling that naturalists of long ago did not write anything about it. In *The Birds of Alaska*, Gabrielson and Lincoln (1959) highlighted the history of ornithological exploration in Alaska during the century leading up to the 1950s, and they outlined the itineraries of naturalists who explored the seabird colonies of the Aleutian Islands and Bering Sea region. Georg Wilhelm Steller was the first outsider to record birds in the region, as the naturalist on Vitus Bering's expedition to Alaska in

1741 and 1743–1744. To judge by his extensive travels, especially among the Aleutian Islands and his visits to Bering Island (Stejneger 1936), it is inconceivable that he would not have encountered Crested Auklets, but he mentioned the species only once, when one landed on board the *Elizaveta* during the night of 10 August 1741, on the ship's return to Kamchatka (Stejneger 1936:428). Such landings of Crested Auklets still attract attention (e.g., Dick and Donaldson 1978). Captain James Cook collected the Crested Auklet at "Bird" (St. Matthew) Island on 29 July 1778 (Stresemann 1949), and, beginning with William H. Dall's travels in the Aleutian Islands beginning in the 1870s (see Appendix), through the first half of the 20th century, a succession of naturalists such as Alfred M. Bailey, Arthur Cleveland Bent, Herbert Brandt, Lt. John C. Cantwell, Elliott Coues, Henry Wood Elliott, Ira N. Gabrielson, Joseph Grinnell, G. Dallas Hanna, Francis L. Jaques, E. V. Kozlova, Olaus J. Murie, Edward W. Nelson, Edward A. Preble, Robert Ridgway, Leonhard Stejneger, Charles H. Townsend, and many others (see Gabrielson and Lincoln 1959) visited auklet colonies and wrote extensively about the avifauna of the Bering Sea. None mentioned the Crested Auklet's scent, although surely at least some of them must have detected it. Perhaps they did not associate the scent with birds, especially with one species in particular. This connection would have been difficult to make without birds in the hand, but specimens were collected on those expeditions, and opportunities to smell the odor must have abounded. Notably, the first published description of the odor was based on its detection while specimens of Crested Auklets were being prepared (Humphrey and Phillips 1958). There may have been other reasons.

Naturalists may have detected the odor but did not consider it that remarkable, but this is difficult to imagine. Had they been worried that no one would believe them if they ascribed such a feature to a bird found in such a remote area? Birds emitting odors like this were not well known 100 years ago. Perhaps the odor was not detected because it cannot be smelled every day, and during short visits near and to the colonies the odor might not have been smelled at all. Such failures should not have affected everyone, but before we consider the ability of humans to detect this scent, let us trace the steps of two of these early ornithologists—Charles H. Townsend in the late 1800s and Ira N. Gabrielson in the 1940s—who visited auklet colonies throughout the Bering Sea region, so that we may appreciate the opportunities these individuals would have had to smell this odor.

In a paper devoted primarily to the Crested Auklet, Townsend (1913) described his experiences with this and other species of auklets, first on the Pribilof Islands, where he spent the first three weeks of June 1885 investigating fisheries (see also Townsend 1885, 1927; Mearns and Mearns 1998). During this time, auklets would have been incubating or feeding newly hatched young and the scent should have been prevalent (see Jones 1993), but Townsend either did not detect the odor or he simply never mentioned it. He collected at least one specimen on the Pribilof Islands during this time, and others elsewhere (Appendix), and his detailed descriptions of the plumages of the Crested and other auklets (Townsend 1913) attest that he examined specimens closely. Townsend left the Pribilof Islands on 21 June 1885 on the steamer *Corwin* and arrived 12 days later at the mouth of the

Kowak River in Kotzebue Sound, having observed Crested Auklets intermittently as the steamer plied its way north (Townsend 1895).

Townsend apparently made four more trips to Alaska, the last in 1895 (Townsend 1897). On each of these trips, he visited several of the Aleutian Islands, but to piece together his itineraries is difficult. On board the *Albatross* in 1888, Townsend traveled from Kodiak Island and the Alaska Peninsula along the entire Aleutian chain toward the Commander Islands off Kamchatka (whether he actually reached this final destination cannot be confirmed, but see Townsend 1913). He did, however, visit several auklet colonies in the eastern and western part of the Aleutian Islands (Townsend 1913, 1927). Townsend's arrival on the Shumagin Islands on 1 August 1888 and his visit to Big ("Koninski") Koniuji Island impressed him. Of the immense numbers of Crested Auklets, he wrote (1913:133), "Rich as our experiences with the Auklets were in many of these places, they did not prepare us for what we were to see in the Shumagin Islands south of the Alaska Peninsula." Flocks of Crested Auklets filled the air, circled over the sea, and lifted off from the colony as he clambered among the boulders, amid which the auklets nested. Although the date was late in the breeding season (see Jones 1993), some scent should have been detectable.

Probably no one visited more seabird colonies than did Gabrielson during his extensive travels in the 1940s (Gabrielson and Lincoln 1959). He visited most of the larger colonies of the Crested Auklet and other seabirds among the Aleutian Islands (Appendix), including Big Koniuji Island, which had been visited by Steller 200 years before (Stejneger 1936), Townsend decades earlier, and where H. D. Douglas III conducted experiments in 2002 (Hirth 2003). Gabrielson also visited colonies on the islands of the Bering Sea, including the Pribilof Islands north to the Diomede Islands (e.g., Gabrielson 1944), which Townsend also had visited decades earlier.

Some of the early naturalists may not have been able to smell the odor. Hector Douglas (in litt., 18 and 19 July 2005) notes that people differ in their thresholds for perception of the Crested Auklet's odor, in nature and in the laboratory. In one laboratory observation, he noted that of five people exposed to the scent of a Crested Auklet specimen, two could not smell the odor at all, whereas three individuals reported the odor was strong. Perhaps some of the early ornithologists had been anosmic, but surely not all of them. We will never know.

DESCRIPTIONS OF THE ODOR

The first published description of the odor produced by Crested Auklets apparently was that of Humphrey and Phillips (1958), based on these authors' separate experiences with auklets early in the 1950s. Philip Humphrey detected the odor quite by accident, inland from the Bering Sea and about 100 km from the nearest breeding colonies. After several days of strong onshore winds in mid-June 1952, Humphrey received four weakened Crested Auklets captured on a freshwater pond at Hooper Bay on the Alaska mainland. While preparing the specimens, he detected (p. 258) "a pungent odor reminiscent of the smell of tangerines" and concluded that the odor "emanated from the region of the bill and was present on all...specimens."

He commented on the "ornaments" on the bright orange bills, as if implying that the color and the tangerine odor were in some way connected. Humphrey cited Ridgway's (1919:775) now-confirmed statement that the bill plates are shed at the end of the breeding season and concluded that this odor "stemmed only from the bill ornaments." Humphrey also noted that museum specimens taken during the breeding season lacked the odor, despite their bills' remaining brilliant orange.

Early in July 1954, at St. Paul Island, Bering Sea, Richard Phillips noted that two Crested Auklets had "a pleasant odor strongly reminiscent of that of citrus fruits and comparable in strength to a freshly peeled orange" (Humphrey and Phillips 1958:258–259). Days later, Phillips detected the same "pungent" odor at sea and realized that it came from a flock of about 200 Crested Auklets that had flushed about 100 yards ahead of the boat and that the odor disappeared with the birds.

The next observation of the odor was published two years later. In a list of birds observed on Little Diomede Island, Kenyon and Brooks (1960:461) observed "the citrus-like odor of [the Crested Auklet] is often quite noticeable, both on the water and in nesting areas. On May 29 [1958] the odor of a flock of about 10,000 auklets was quite strong at least half a mile downwind while the birds were hidden from view by fog." These and Phillips's observations confirmed that Crested Auklets produce this odor at least during the breeding season. The Parakeet Auklet, Least Auklet, and other seabirds were present on St. Paul and Little Diomede islands when some of these observations were made, but the authors associated the odor with the Crested Auklet only.

The odor was mentioned in a study of the functional anatomy of 23 orders of birds (Bang 1971), in two dictionaries of birds (Thomson 1964, Campbell and Lack 1985), and in a survey of birds odorous or unpalatable to humans (Weldon and Rappole 1997). Bang (1971:40) noted that the bill plates had been described as smelling of tangerines during the breeding season, but there were no inferences that olfaction was important to this or any other species of the Charadriiformes, and the Crested Auklet is unremarkable anatomically. Neither Thomson (1964) nor Campbell and Lack (1985) indicated the source of their information, although when describing the structure of the Crested Auklet's bill, Thomson (1964:67) noted "the plates give out an odour like that of tangerine oranges." Discussing the scents emitted by several species of birds, scents produced by the uropygial or oil glands, Campbell and Lack (1985:406) noted that the "noticeable odor" of Crested Auklets seems not to be produced by the oil gland." Weldon and Rappole (1997), citing Thomson (1964), listed among the alcids only the Crested Auklet as one of the species of birds producing an odor.

SOURCE AND FUNCTION OF THE ODOR

Shedding of the bill plates after the breeding season suggests the bill as the source of the scent, but any connection between this molt and the cessation of the production of odor at this time is tenuous, likely coincidental. I definitely detected odor less toward the end of the breeding season, but fewer birds were visiting the colony then, and the intensity of odor would have

been less. Douglas (pers. comm.) points out that detection of an odor is one thing, but concluding that it no longer is being produced, because it cannot be smelled, is another. But other anecdotal observations suggest that the odor is produced only during the breeding season, and these are supported by recent experimental evidence in favor of a breeding function. Hagelin (pers. comm.) notes that the odor declines noticeably in captive Crested Auklets at the end of the breeding season. Three black-billed second-year Crested Auklets collected at sea on 10 July 1966 were odorless. These individuals lacked brood patches (see Bédard and Sealy 1984), and birds of this age seldom visit the colonies (Jones 1993). I also did not detect the scent among the 15 Crested Auklet chicks I measured daily while quantifying growth, or among eight fledglings captured among the boulders on their way to sea (Sealy 1968). All that is known about the initiation of production of odor prior to breeding is that it is detectable as soon as the birds return in spring to the waters near the colonies.

WHISKERED AUKLETS PRODUCE A SIMILAR ODOR

Many species of birds produce odors that are detectable by humans (Weldon and Rappole 1997), including the Crested Auklet's close relative, the Whiskered Auklet (*A. pygmaea*). Both these auklets produce a citrus-like odor, but their chemical constituents differ (Douglas et al. 2004). Gaston and Jones (1998, see also Jones 1993) alluded to an odor produced by the Whiskered, which is more remarkably ornamented than the Crested, although the bill of the Whiskered is not as brilliantly colored, with little or no orange (Byrd and Williams 1993). On the basis of compatibility analyses of an array of characters of the skeleton, integument, and natural history, Strauch (1985) placed the Whiskered and Crested auklets side by side in his classification of the Alcidae. Focusing on shared characters, Gaston and Jones (1998) hypothesized that the Crested and Whiskered auklets are the most closely related of the true auklets. Friesen et al. (1996) could not discriminate the phylogenetic relationships of these auklets from molecular data, but their findings nevertheless supported Gaston and Jones's hypothesis (1998). In a comparative study of courtship behavior of auklets at sea, Hunter and Jones (1999) observed Crested Auklets performing the ruff-sniff display exclusively and the "neck-twist" display almost exclusively, at sea and on land, whereas Whiskered Auklets performed a display, the "head-bob," at sea (and possibly on land) but did not perform the ruff-sniff or neck-twist displays (Hunter and Jones 1999, Zubakin and Konyukhov 1999, Hagelin in litt., 5 June 2005; Douglas pers. comm.).

Kenyon and Brooks (1960) noted that neither the Parakeet nor Least auklet produces an odor, and Bédard and I never smelled one when either species flew by or flushed at sea or when we handled live or dead individuals, although under these circumstances we smelled the Crested Auklet. It has been determined in the laboratory that the plumages of the Parakeet Auklet (Hagelin et al. 2003) and Least Auklet (Douglas et al. 2004) lack the odor constituents of the Crested Auklet.

UNRESOLVED QUESTIONS

Biologists have only recently begun to appreciate the importance of a sense of smell among birds, having instead focused on song and conspicuous plumage as typical means of communication. Brightly colored bill plates, elaborate forehead crests and auricular plumes, and vocalizations have long been familiar characteristics of the Crested Auklet, but the presence of another sexual "ornament," a chemical signal, possibly adds another dimension to the species' communication system. It also increases the evidence for the importance of smell in birds. Jones (1993:6) noted that for such communication, auklets should respond to one another's odor, and apparently they do (Hagelin et al. 2003). But evidence also exists for chemical defense (Douglas et al. 2004). Experiments now underway should enhance our understanding of this and other signals in the Crested Auklet, and they may be found to act in tandem. Experiments need to be conducted on the Whiskered Auklet. Other questions remain.

What is the selective pressure for the evolution of scent in these auklets? Does the odor vary in intensity or quality from individual to individual, as do the plumage ornaments (Jones 1990, Jones et al. 2000)? Variation would give females a basis for choosing their mates, with the scent functioning as an indicator of the male's quality, as Jones (1993) speculated. Individuals studied over many years may reveal fitness benefits of the odor and reveal costs associated with producing and using it. Jones (1993) wondered whether the scent might be important in social communication among individuals at sea. The scent is especially strong at sea, but possibly it is more detectable there, at least by humans. Why do only two species of auklets produce the odor, and not others with similar ecology and behavior? For so long the odor of the Crested Auklet went unnoticed or undescribed, but its nature and function are finally emerging.

ACKNOWLEDGMENTS

The impetus for this summary of early reports of the Crested Auklet's odor arose from the exciting research of Hector D. Douglas III and Julie C. Hagelin, Ian L. Jones, and collaborators, and my memories of the scent smelled long ago while studying auklets. Many residents of Gambell shared their knowledge of the odor and assisted with my field work in different ways. I am especially indebted to my colleague, Jean Bédard, for sharing his experience and knowledge of alcids, and of St. Lawrence Island. Hector D. Douglas III, Robert H. Day, Julie C. Hagelin, David C. Shinen, Gus B. van Vliet, and Kevin Winker responded to my inquiries for information, and Victor A. Zubakin searched Russian literature for information on the odor. Daniel D. Gibson helped with literature pertaining to C. H. Townsend's travels in Alaska, provided information on place names, and edited the manuscript. Day, Douglas, and Hagelin commented on various drafts of the manuscript, and the latter two generously allowed me to include their unpublished observations. James Dean, United States National Museum, provided information on specimens of Crested Auklets taken by some of the early naturalists (summarized in the Appendix). Peter Capainolo and Maureen Flannery checked the holdings of the Crested Auklet in the American Museum of Natural History and California Academy of Sciences, respectively. I am indebted to Lisa M. Sheffield for inviting me to St. Lawrence Island in 2003 and 2004 where, with Ian C. Rose and Zubakin,

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Appendix 1. Crested Auklets collected by three early naturalists in Alaska and Russia.

William H. Dall.—Five skins are catalogued in the United States National Museum (USNM): USNM 68391 and 68392, July 1874, Big Koniuji Island (Shumagin Islands); USNM 61623, 13 December 1871, Unalaska Island; and USNM 65493 (nestling), 3 July 1873, Kyoka (= Kiska) Harbor, Kiska Island. The fifth specimen (USNM 45665) was collected at Plover Bay, Russia, 15 September 1866. There are also several partial skeletons (mostly skulls) from Alaska.

Charles H. Townsend.—At least four skins and one skeleton: USNM 106870, 8 June 1885, Otter Island (Pribilof Islands); USNM 200969, 19 June (year?), Yukon Harbor (Big ["Koninsky"] Koniuji Island); and USNM 18442 (skeleton), 26 August 1888, Yukon Harbor (Big Koniuji Island). Ridgway (1983) referred to two (more) skins (probably USNM 115847 and 115848) taken on Big ["Koninski"] Koniuji Island on 4 August 1888, during the cruise of the *Albatross*. USNM 115848 was later exchanged with the Albany Museum in South Africa in 1897 (J. Dean in litt., 22 March 2006).

Ira N. Gabrielson.—Sixteen skins in USNM, three from Chagulak Island, one from St. Paul (Pribilof Islands), and 12 from Kasatochi Island.

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White-tailed Ptarmigan (*Lagopus leucura*) along trail to Mt. Audubon, Roosevelt National Forest, Colorado, 24 September 2006, during a field trip from WFO's 31st annual meeting in Boulder, Colorado.

Photo by David Krueper

SWIFT-HUNTING BEHAVIOR OF THE PEREGRINE FALCON IN ARIZONA

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ABSTRACT: Among the solo and cooperative attacks by Peregrine Falcons (*Falco peregrinus*) on White-throated Swifts (*Aeronautes saxitalis*), the most spectacular are long series of declining stoops (sometimes involving elevational changes of up to 1 km). These repeated stoops sometimes result in falcons attempting to strike prey while climbing as well as when diving. An unspectacular technique involves swooping up, stalling, and grasping at swifts coming and going from a cleft in a cliff wall.

With all that has been published in the scientific literature about Peregrine Falcon (*Falco peregrinus*) foraging behavior (Porter et al. 1987), and all the elaborate descriptions of human-staged hunts in the falconry literature, it would seem that nothing has been left undescribed. However, the terseness required in scientific writing normally disallows the detail necessary to capture the dynamics of the falcon chase. At least two papers are exceptions to this rule in that they provide careful descriptions of entire hunting sequences. The first is Monneret's (1973) account of hunts by nesting Peregrines. The second includes accounts of using helicopters to follow hunting Peregrines and Gyrfalcons (*F. rusticolus*) (White and Nelson 1991). Dekker (1980) provided abbreviated, but compelling, descriptions of many hunts and identified at least seven methods by which Peregrines flush and/or pursue birds. Cade (1982), Bird and Aubry (1982) and various other authors (most are cited by White and Nelson [1991]) provide useful summaries of the general techniques used by Peregrines.

My focus here is to provide details of Peregrines' pursuits of White-throated Swifts (*Aeronautes saxatalis*) in Arizona. Arnold (1942) published an account of a pair of falcons capturing a White-throated Swift, but he was unsure if the predators were Peregrines or Prairie Falcons (*F. mexicanus*). It is known that other species of swifts elsewhere around the world are hunted by falcons, for example, the Hobby (*F. subbuteo*; Tinbergen 1969:199), Eleonora's Falcon (*F. eleonorae*; Walter 1979), and the Bat Falcon (*F. rufigularis*; Beebe 1950). The swifts captured, however, were mostly inexperienced juveniles (Walter 1979:138–139) or weakened by prolonged storms (Tinbergen 1969). On the Colorado Plateau (Arizona, Colorado, Utah, and New Mexico) the Peregrine may eat swifts more extensively than elsewhere. In a study of Peregrine food habits on the Colorado Plateau (Ellis et al. 2004), the White-throated Swift was the species most frequently encountered among prey remains in eyries: 102 of 391 birds taken (26%) were swifts. For all of Arizona, swifts constituted 172 of 795 birds in the diet by number (22%).

Incidental to studies of Peregrine Falcon demographics (Ellis 1988) and ecology (Ellis 1982), which began in 1975, we witnessed 130 hunts (Ellis and C. T. LaRue unpubl. data), the most dramatic of which were directed

at swifts. These attacks, often involving vertical distances of about 1000 m, sometimes included dozens of stoops at a single swift. Some were solo hunts; others were spectacular cooperative hunts in which the falcons often attacked the swift from both above and below.

Here I describe seven attempts by Peregrines to capture swifts and two observations of Peregrines possibly using Common Ravens (*Corvus corax*) to conceal their approach. I selected the seven attempts because each was in some way typical of a particular hunting strategy. Although these techniques are largely known from other studies, here I supply details of the attack methods.

SOLO HUNTS

Lower Reaches of the Grand Canyon of the Colorado River, 26 March 1981

Between 08:15 and 08:48, one adult male made three attempts at capture. All took place in the same general area (Figure 1) and followed the same general sequence. All were probably directed at swifts, but the distances were such that I was confident of the prey only on the first foray, described next. The Peregrine was first seen soaring up out of the abyss in front of the Supai Formation (here a wall about 120 m in height). When above the rim of the Supai (elevation ~1375 m), he crossed the canyon in a long glide (~1.3 km), then circled up to approximately the rim of the Toroweap

Figure 1. Inner gorge of the Grand Canyon of the Colorado River and site where a male Peregrine Falcon pursued a White-throated Swift for a vertical kilometer on 26 March 1981.

Formation (elevation 1750 m). After soaring another ~1.5 km south, he swept his wings back and dropped into a dive at ~30° below horizontal. After stooping ~0.4 km to mid canyon, he suddenly turned sharply downward and plunged vertically ~300 m until flashing past the swift. The falcon then pulled sharply out of the stoop and, with wings pumping, shot up ~100 m. As soon as he started to slow because of gravity, he began deep, rapid flaps and passed inverted across the zenith of his ascent. By crossing the apex upside down, he was able to put the full force of his wings into fighting centrifugal force, decreasing the radius of his overhead arch, and maintaining speed for the next plunge. His second stoop took him down the face of the Redwall Limestone and out of sight into the canyon. The outcome of the attack was not seen, but within 5 minutes he was again soaring up the Supai Formation without prey. The vertical distance between the onset of the first stoop and the nadir of the second was ~1000 m (910 m in one estimate based on visual approximations using 185 m as the height of the Redwall Limestone and 1070 m in a second estimate based on elevations on USGS topographic sheets).

Salt Eyrie, Central Arizona, 18 July 1978

Some solo hunts are almost as spectacular as the most dramatic cooperative attempts. At the opposite extreme, however, was a series of solo attempts by an adult female to catch swifts entering and leaving a long vertical crack in the quartzite cliff only ~60 m below her eyrie. I watched the site from 07:00 to ~19:50. During that time, two adults and one well-fledged juvenile were around the eyrie. From 19:20 to 19:25, the adult female swooped up to the crack, stalled, fell away without prey, swooped out from the cliff wall to gain speed, then turned and, flapping, rose up again to the crack, this time grasping prey which she delivered to the screaming juvenile on a pinnacle ~200 m away.

Between 19:25 and 19:32, the female visited three perches and passed back and forth along the rim of the eyrie cliff. At 19:32, she returned to the crack and made four more pendulum-like sorties against the wall, all in apparent efforts to snatch swifts. In each of these attempts, she swooped up to the crack, stalled, and, with a few fluttering wing strokes, grabbed at passing swifts. Then she turned, fell away from the cliff, and swooped downward and out ~30 m while flapping and gathering speed. Then, rising up, she used her momentum to turn back up toward the cliff and, while flapping, rose up again to the crack, stalled, and again tried to grasp a swift. After the fourth attempt, she flew to a boulder on the steep hillside and, apparently without prey, perched until it was too dark for me to see her departure.

POSSIBLE USE OF A RAVEN AS A BEATER

Glen Canyon of the Colorado River, Northern Arizona, 25 March 1982

Peregrine Falcons have long been known to use other birds or even machines (Bishop and Bishop 1972, Ellis et al. 1993) to flush prey or to conceal the falcon's approach to prey. In the canyon country of northern Arizona, it is normal to see two Common Ravens passing in tandem along the cliff

walls. The second raven very often trails the first by roughly 20–100 m. Twice on 25 March 1982 I saw an adult female Peregrine Falcon patrolling the canyon rim, trailing about 100 m behind a raven. So routine is it to see two ravens in tandem that, after noting that the first bird was a raven, I gave the second bird hardly a glance (expecting it to also be a raven), but in that brief glance, saw the falcon. Although I did not see her dive on prey from this position, I suspected that following the raven was a hunting tactic. The raven showed no alarm or avoidance at having the falcon in tow.

COOPERATIVE ATTEMPTS AT SWIFTS

Great Wall Eyrie, Southeastern Arizona, 4 March 1980, 16:54

Both adults dived off the cliff (175 m tall) where they nested (Figure 2) and, with a few rapid wing beats, plunged diagonally downward at a swift then flying horizontally at only ~15 m above the canopy of oaks at the base of the cliff. After the first attempt, the adults timed their attacks so that they crossed the trajectory of the swift almost simultaneously: one falcon shooting up vertically at the swift while the second falcon plunged vertically from above. Again and again the pair passed through the swift's path until, after six such attempts, the swift disappeared among the oaks. During these attacks, the top-to-bottom diameter of each loop described by the falcons was ~100–150 m. The female righted herself at the top of each loop, but

Figure 2. Adult Peregrine Falcon at an eyrie in southeastern Arizona where swifts are commonly taken as prey.

the male, rather than disrupt the flow of his motion, crossed the top of each loop with his underparts skyward, then plunged downward again for another attempt at the swift. The falcons flapped mostly just after the top of each loop as they gained speed for the next plunge.

Grand Canyon of the Colorado River, Hance Rapids, 19 March 1977

At about 10:00, two adult Peregrine Falcons swept down from a side canyon, north toward the river, and entered the inner gorge in relentless flapping pursuit of a swift. The swift was fluttering along erratically only ~10–15 m above the dunes and rock piles. After each adult stooped ~12 times, the swift crashed into the boulders on the north side of the river. The Peregrines showed no interest in pursuing the fallen swift but flew to separate perches near the rim of the Hakatai Formation.

After nearly a half hour without activity, both adults, with rapid wing beats, leaped off the cliffs and intercepted another swift low over the dunes. Each bird, in roller-coaster dives (each loop ~70–100 m in diameter), stooped at the swift ~15 times. The swift, although flapping furiously, made only slow forward progress during the attack, perhaps only 50 m forward for each stoop of a falcon. Occasionally one falcon continued across the apex of its stoop with its body inverted (belly to the sun). Finally, the harried prey plunged into the Colorado River near mid-stream. Each adult falcon then, in slow flapping flight, passed over the downed bird about five times before the female grabbed the prey and flew down river out of sight.

Glen Canyon, North-Central Arizona, 25 March 1982

Surely this was the most persistent attack I ever witnessed. While hiking along the rim of the canyon, I first noted the adult female Peregrine arrive. She came in from the north and circled up high over the rim. Within 1 minute, I saw the male also circling overhead but much higher than the female. At 12:42, the male began a long, shallow, flapping stoop to the north. The female followed. Between 12:42 and 12:48, both birds stooped again and again at a swift about 15 m below the canyon rim. Time after time, the male plunged down toward the swift, then, having missed, shot upward trying to make contact while on the rise. Each cycle occupied ~100 m from crest to trough. The female also stooped again and again, but her circles were only about 25 m in diameter, so she actually made approximately 2.5 cycles to one by the male. After about 20 cycles by the male and about 40–50 by the female, the swift disappeared; both birds broke off the chase and began soaring up over the canyon. By 12:50, the male and female were seen south of the canyon pursuing another swift. After only a few stoops, the birds dropped out of sight behind an intervening hill but soon reappeared, this time with the female clutching a swift. While on the wing soaring above the canyon, she plucked and consumed the swift (until 13:05). During her meal, she was pursued by two ravens in a shallow stoop extending nearly 1 km. The nearest raven briefly drew within 20 m of the female. Her facility in evading the ravens was attested by her continuing to pluck and feed even while one raven was still in pursuit.

BEHAVIOR OF SWIFTS

When using high-amplitude stoops, either while hunting solo or in tandem, the falcons' first attacks normally occurred with the swift well exposed, far from cover. Thereafter, the swifts typically seemed vulnerable, but they may have been difficult to capture as they paddled erratically about with rapid wing beats, body teetering from side to side, at what appeared to be rather slow forward speed. The secondary strategy in many attacks was to approach the ground or a cliff face closely, in an apparent effort to thwart the attack by increasing the risk to the falcon of colliding with the terrain. The ultimate result of this tactic was seen in the Hance Rapids observations of 1977 when one swift plunged into the boulders and another into the water.

DISCUSSION

In Arizona, Peregrine Falcons use a variety of tactics to hunt swifts, the most common being long high-speed stoops from high above. I never saw the kind of "tail chase" pursuit observed by Arnold (1942). This suggests to me that the raptors he observed were Prairie Falcons, not Peregrines, a more likely choice given the location (a hot, dry, desert environment far from permanent water).

The male Peregrines seemed much more agile than the larger females, as attested by their often maintaining speed in each stoop–climb cycle by crossing the zenith of some loops inverted and flapping furiously to maintain speed. I would have expected the larger females to describe loops of larger diameter than did the males, but not so; the females sometimes flew traveling loops ~25 m in diameter (from zenith to nadir) with the strike at the swift occurring only at the bottom. The males, by contrast, normally flew loops up to 100 m in diameter and more frequently struck twice in each loop, once in crossing the swift's trajectory while plunging vertically downward and again while shooting vertically upward.

The sounds accompanying these attacks add much to the spectacle. The whistling roar of the falcon begins as it reaches maximum velocity plunging downward, but the roar is loudest and changes to a sound like the ripping of a great canvas sail when, for a few seconds, the falcon arches, countering the downward momentum of its dive, and, forcing its wings against the centrifugal force of the arc, curves skyward.

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LONG-BILLED CURLEW DISTRIBUTIONS IN INTERTIDAL HABITATS: SCALE-DEPENDENT PATTERNS

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ABSTRACT. Key ecological insights come from understanding a species' distribution, especially across several spatial scales. We studied the distribution (uniform, random, or aggregated) at low tide of nonbreeding Long-billed Curlew (*Numenius americanus*) at three spatial scales: within individual territories (1–8 ha), in the Elk River estuary (~50 ha), and across tidal habitats of Humboldt Bay (62 km^2), California. During six baywide surveys, 200–300 Long-billed Curlews were aggregated consistently in certain areas and were absent from others, suggesting that foraging habitats varied in quality. In the Elk River estuary, distributions were often (73%) uniform as curlews foraged at low tide, although patterns tended toward random (27%) when more curlews were present during late summer and autumn. Patterns of predominantly uniform distribution across the estuary were a consequence of territoriality. Within territories, eight Long-billed Curlews most often (75%) foraged in a manner that produced a uniform distribution; patterns tended toward random (16%) and aggregated (8%) when individuals moved over larger areas. At each spatial scale, food probably had the strongest influence on distributions, whereas predation played a relatively minor role in determining patterns.

During the nonbreeding season, shorebirds forage either alone or in flocks of varying size and density (Myers 1984, Goss-Custard 1985). Individuals form flocks in areas where the availability of food is greatest (e.g., Wolff 1969, Bryant 1979, Colwell and Landrum 1993) or owing to various antipredator benefits (Myers 1984). In a few shorebird species, dispersion patterns deviate from flocking, with individuals widely spaced in foraging habitats (Goss-Custard 1985). These hyper-dispersed patterns result mostly from territoriality (Goss-Custard 1985), with individuals defending food resources for varying durations (Colwell 2000).

The Long-billed Curlew (*Numenius americanus*) is among the most imperiled species of nearctic shorebird (Brown et al. 2001). During the nonbreeding season, curlews occupy intertidal habitats, coastal pastures, agricultural fields, and freshwater wetlands from Willapa Bay, Washington, south along the Pacific coast through Mexico (Dugger and Dugger 2002). Humboldt Bay, California, is the most northerly wintering area for large numbers of curlews (Paulson 1993). Colwell (1994) estimated that several hundred curlews use the bay, where they feed in intertidal habitats on bi-

valves, shrimps, polychaete worms, crabs, and small fishes (Leeman et al. 2001).

At Humboldt Bay, some curlews defend low-tide territories from June through March, although territory occupancy declines in autumn (Colwell and Mathis 2001). This seasonal decline in use of intertidal habitats coincides with higher diurnal low tides (Dodd and Colwell 1996), which inundate foraging areas (Colwell and Mathis 2001), and the onset of winter rains, which increases the availability of alternative foraging habitats in pastures (Colwell and Dodd 1995, 1997, Leeman and Colwell 2005). In this study, we quantified Long-billed Curlew distributions at three spatial scales: within individual territories spanning <10 ha, in a small estuary (<100 ha), and across intertidal habitats of the entire bay (>1000 ha), corresponding to individual, local, and regional scales (Myers 1984). Understanding how curlews are distributed across intertidal habitats is critical to effective management and conservation. For example, as the largest North American shorebird, curlews foraging in areas valued for sport clamming may be most vulnerable to anthropogenic disturbance, and mitigating for this sort of habitat degradation requires knowledge of space use. Furthermore, rising sea levels associated with global warming will alter the availability of intertidal foraging habitats used by curlews (Galbraith et al. 2002), with consequences for wintering curlew populations.

STUDY AREA

We studied curlews from 1998 to 2002 at the Elk River estuary and within Humboldt Bay (Figure 1). Humboldt Bay consists of two large basins, South Bay (1797 ha) and Arcata Bay (4103 ha), connected by a shipping channel opening to the Pacific Ocean. The bay has mixed semidiurnal tides (Barnhart et al. 1992). At mean lower low water (0.43 m), receding tides expose approximately 4492 ha of intertidal habitat (Mathis 2000) consisting of bottom sediments that range in size from silt to gravel (Danufsky and Colwell 2003). In most areas of the bay, human use of intertidal habitats at low tide during our study was minimal. The Elk River estuary covers approximately 50 ha on the east shore of the shipping channel. At the estuary's southern end, cordgrass (*Spartina foliosa, S. densiflora*), pickleweed (*Salicornia pacifica*), saltgrass (*Distichlis spicata*), and dunes dominated by European beach grass (*Ammophila arenaria*) border a kilometer-long steep-banked river channel. To the north, the intertidal habitat broadens to include mixed-elevation flats dissected by channels. At the river's mouth is a gently sloping tidal flat sparsely vegetated with eelgrass (*Zostera marina*) amid silt to gravel substrates.

METHODS

Field Observations

To quantify baywide distributions, we coordinated multiple observers in a synchronized effort to map curlews on six occasions during fall and winter of 1998–99 and 1999–2000 (Table 1). Observers conducted surveys when

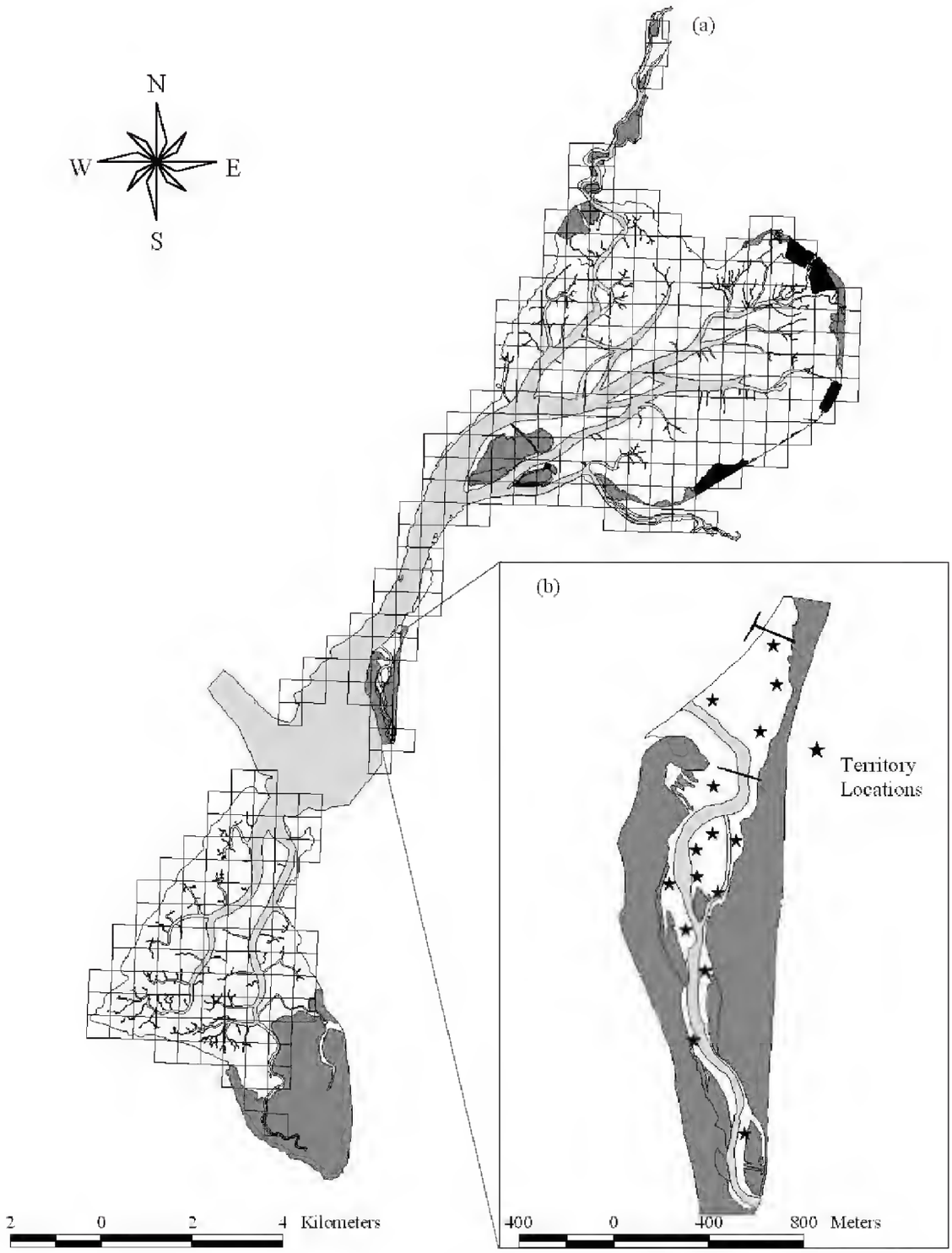

Figure 1. Humboldt Bay, California study area (a) overlaid by 500-m grid used to examine spatial variation in summed counts of Long-billed Curlews during six autumn and winter low tides. Inset (b), Elk River estuary, where stars (★) indicate approximate locations of curlew territories. Dark gray shading, salt marsh fringing the bay; lighter gray shading, main shipping channels of the bay.

Table 1 Long-billed Curlew Abundance and Spatial Distribution on Six Surveys of Intertidal and Pasture Habitats at Humboldt Bay

	1998–1999			1999–2000		
	4–5 Oct	30–31 Jan	27–28 Feb	23 Oct	29–30 Jan	13 Feb
Number of curlews in intertidal habitats	301	286	209	203	176	168
Curlew density (ha^{-1}) in intertidal habitats	0.09	0.08	0.06	0.06	0.05	0.05
Number of curlews in pastures	0	14	121	10	105	159
Total number of curlews observed	301	300	330	213	281	327
Average number of curlews per grid cell	0.91	0.87	0.63	0.62	0.53	0.51
Variance of curlews per grid cell	2.51	6.14	1.95	1.71	1.71	1.86
Dispersion index (I)[a]	2.75	7.08	3.07	2.79	3.20	3.66
t[b]	10.26	33.79	8.47	7.01	7.57	8.66
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

[a]Variance:mean ratio (Krebs 1989).

[b]$t = \frac{\text{variance} - \text{mean}}{2\sqrt{[2/n-1]}}$, df = 329.

predicted diurnal low tides of ≤0.3 m exposed most tidal flats. We scanned tidal flats, sloughs, and adjacent pastures using binoculars and spotting scopes; we observed curlews far from shore from boats that moved slowly through the bay's channels. During surveys, we mapped curlew locations on transparencies overlaying high-resolution images (0.3-m pixel) photographed approximately 1 year prior to fieldwork (Terra-Mar 1997). For ease of data collection we overlaid images with a 50–100-m UTM-based grid; prominent landmarks (e.g., channels, wharf pilings, and peninsulas) aided mapping. We conducted surveys over 1 or 2 days, and each survey consisted of a 30- to 60-minute scan of habitats coinciding with the predicted low tide. In 2002, we quantified seasonal variation in curlew abundance at daytime high-tide roosts by surveying intertidal habitats on 28 occasions. We divided the survey interval into winter (2 January–28 February; $N = 8$), spring (1 March–15 May; $N = 10$), and autumn (1 August–16 October; $N = 10$) intervals. See Colwell et al. (2003) for details on survey methods for roosting shorebirds.

In the Elk River estuary, we collected data on distributions of multiple curlews and on individuals within their territories. In the estuary, Colwell used a spot-mapping technique (Bibby et al. 1992) to record curlew locations on 133 low tides from 20 May 1999 to 4 April 2000. We observed curlews from the estuary's eastern edge over a 1-hour period bracketing the 1-hour interval coinciding with the predicted low tide. See Colwell and Mathis (2001) for details of survey methods.

To quantify individual variation in space use within territories, we used a focal sampling technique (Altmann 1974) to map curlews at low tide on high-resolution images. During a 2-hour observation, we recorded curlew locations every 2 minutes, yielding 60 locations per focal sample. Observers worked in teams of two, with one person using a 20- to 60-power spotting scope maintaining constant visual contact with a curlew; a second person recorded details on diet, behavior, and location as dictated by the principal observer. In total, we conducted 65 focal observations, divided among eight territorial curlews. Although we did not capture and mark curlews to confirm that the same individuals repeatedly occupied territories, in several cases we used distinctive plumage characteristics that persisted over short (weeks) or long (years) intervals to support the notion. See Leeman et al. (2001) and Colwell et al. (2002) for details.

Data Summary and Analyses

We digitized curlew locations into the ArcView geographic-information system (GIS; ESRI, Redlands, CA). We used two different methods to quantify dispersion owing to the relative imprecision of mapping birds across the whole of Humboldt Bay as compared with finer-scale mapping in the Elk River estuary. At the scale of Humboldt Bay, we characterized baywide distributions by entering locations as points, overlaid with a 500 × 500-m grid to reduce the number of cells with no curlews. Grid size had only a minor influence on results (Mathis 2000). For each of the six surveys (Table 1), we summed the number of curlews in each cell. Next, we calculated the mean number of curlews for 330 cells overlying intertidal habitats (Figure 1). To characterize baywide distributions, we calculated a dispersion index ($I = s^2 : \bar{x}$; Krebs 1989). This index equals 1 when a distribution is random, or it can be either aggregated (>1) or even (<1). For each survey, using a two-tailed t test (Getis and Boots 1978), we compared the significance of the distribution to a random pattern. To examine whether curlews used some areas consistently, we correlated the number of curlews in each grid cell between surveys, by means of Spearman's rank-correlation test.

To quantify dispersion within the Elk River estuary, we compared each spot-mapped distribution to a random pattern, using data from July to October, coincident with low tides ≤0.3 m ($N = 22$) and when ≥8 curlews were present. We restricted analyses to these conditions because this tide level exposed nearly 100% of intertidal habitat and some curlews were more likely to be absent from territories at higher tides (Colwell and Mathis 2001). To quantify dispersion of individuals within their territories, we used the 60 locations (recorded at 2-minute intervals for 2 hours) derived from each 2-hour focal sample. We analyzed each focal sample separately ($N = 65$) and summarized multiple observations for each territory.

For each focal sample and spot map, we compared curlew locations to a random spatial pattern by using the nearest-neighbor method in Animal Movement (Hooge and Eichenlaub 2000), a GIS extension. This technique compares the distance between locations to a pattern generated from random points within an area (territory or estuary). The analysis yielded an R

value as an index of dispersion. When curlews were randomly distributed, values equaled 1, whereas values greater than or less than 1 corresponded to uniform and aggregated distributions, respectively (note that this is the reverse of the dispersion index above). We used Spearman's rank correlation to compare distributions with curlew numbers or area used.

RESULTS

Baywide Distributions

During six baywide surveys, most curlews were aggregated in intertidal habitats (Table 1, Figure 2). Curlews occurred in higher densities in some areas (21–39% of cells with at least one curlew) and were absent from others (61–79% of cells with no curlews). The number of curlews recorded in each cell from survey to survey was correlated positively (r_s = 0.35–0.69, $P < 0.001$), indicating that the spatial distribution was repeatable. The total number of curlews (using bay and pasture habitats) varied from 213 to 327. In intertidal habitats, 168–301 ($\bar{x}$ = 224 ± 56) curlews were observed at densities of 0.05–0.09 ($\bar{x}$ = 0.07 ± 0.02) birds per hectare. During winter surveys, the number of curlews using pastures ranged from 10 to 159 ($\bar{x}$ = 81 ± 66). In both years, curlew numbers in intertidal habitats declined from October to February, whereas numbers in pastures increased (Table 1). We rarely observed curlews using pastures prior to the onset of winter rains. During high-tide surveys, we observed curlews roosting at a total of 58 locations around the bay, although the number of roosts varied seasonally (Figure 3).

Estuary Patterns

From July through October 1999, when residency of individuals on their territories in the Elk River estuary was highest (Colwell and Mathis 2001), density averaged 0.36 (±0.09) curlews per hectare, one of the highest concentrations for the bay. At the same time, distributional patterns in the estuary were mostly uniform (73%) or random (27%). Distributions were negatively correlated with abundance (r_s = –0.46, N = 22, P = 0.03), indicating that a random distribution was more frequent when there were more curlews. After October, there were too few (1–9) curlews (Colwell and Mathis 2001) for spatial distributions to be analyzed.

Individual Curlews' Use of Space

We observed eight territorial curlews in the Elk River estuary on 65 occasions through 130 observation-hours yielding 3900 individual point locations. Distributions of these eight curlews within their territories were predominantly (75% of observations) uniform (Figure 4), although patterns were more random (16%) and aggregated (8%) as curlews foraged over larger areas (r_s = –0.55, N = 65, $P < 0.001$). Details on these curlews' home-range sizes and distances moved during focal observations were reported by Leeman et al. (2001) and Colwell et al. (2002).

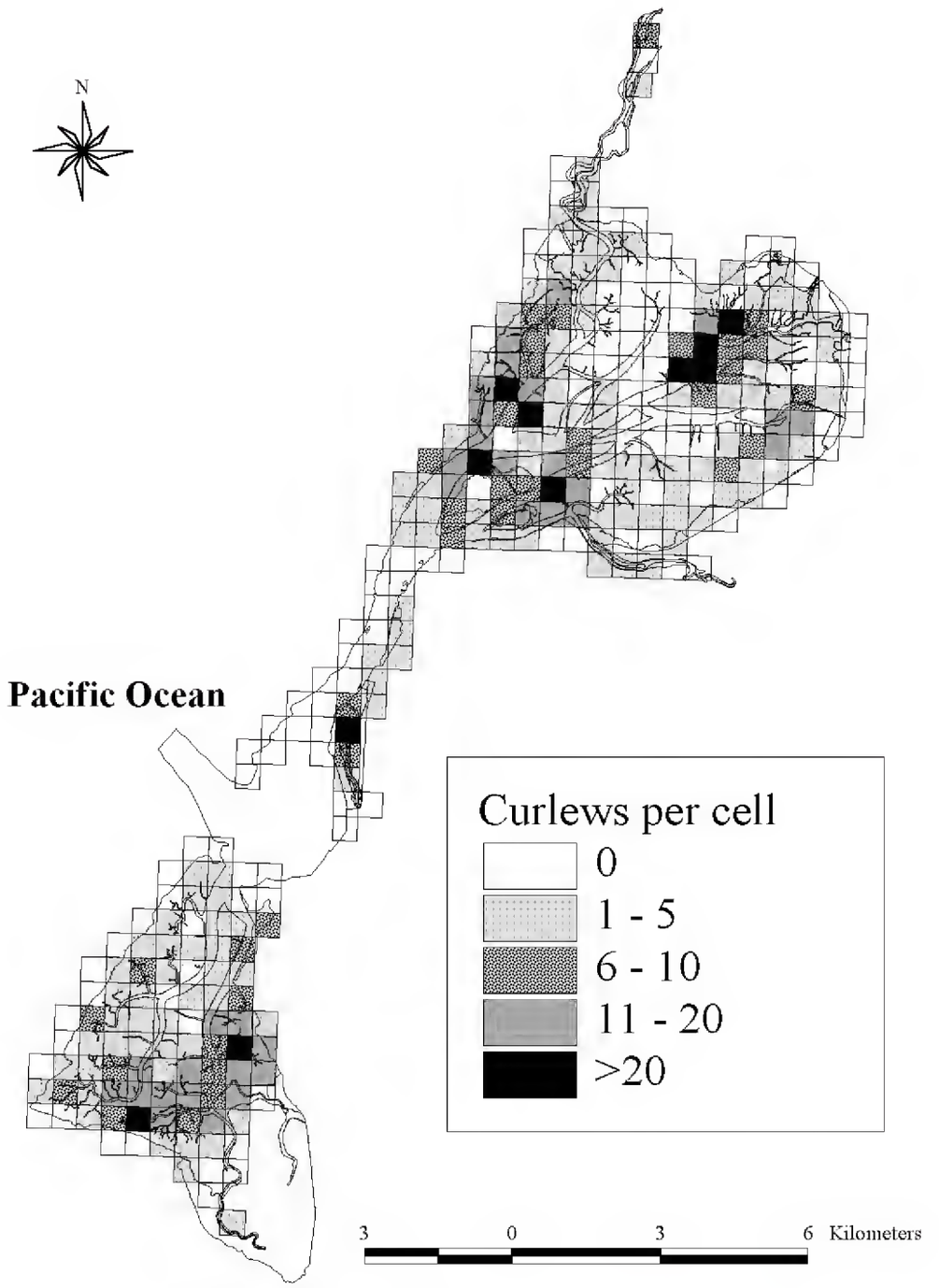

Figure 2. Spatial variation in Long-billed Curlew use of intertidal habitats of Humboldt Bay based on summed observations from six low-tide surveys (Table 1).

DISCUSSION

Across the intertidal habitats of Humboldt Bay, the Long-billed Curlew was aggregated at low densities (0.05–0.09 birds per hectare), and these patterns were spatially correlated from survey to survey. However, these estimates mask substantial variation across habitats. Densities were an order of magnitude higher in the Elk River estuary (0.1–0.4 curlews per hectare), whereas curlews were consistently absent from some other intertidal reaches. Such patchy distributions indicate that areas of the bay vary in quality of foraging

Figure 3. Roost locations and comparative abundances of Long-billed Curlews at diurnal high-tide roosts during winter, spring, and fall 2002.

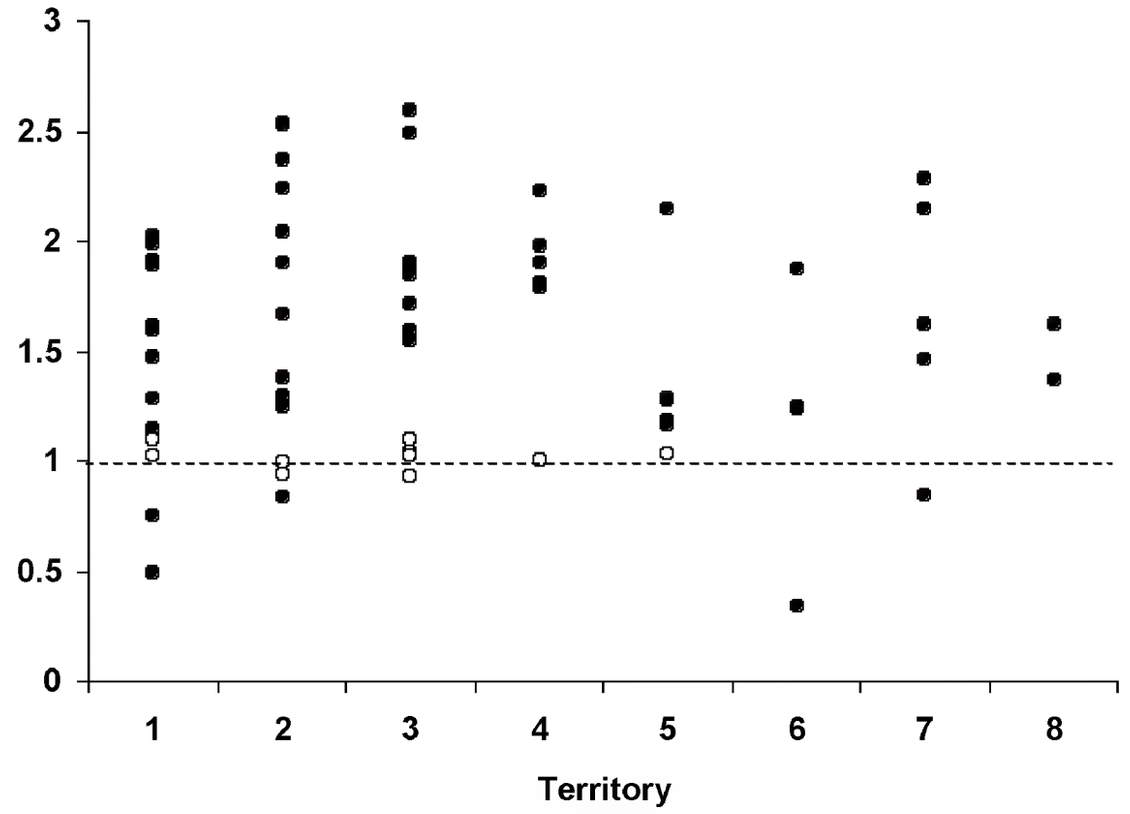

Figure 4. Spatial distributions of eight Long-billed Curlews in the Elk River estuary. Each observation represents a low-tide distribution of a focal-sampled curlew on its territory, based on 60 point locations recorded at 2-minute intervals for 2 hours. Distributions deviating from random (○) are either uniform (●; >1) or aggregated (●; <1) patterns.

habitats, which are probably correlated with habitat features that influence prey abundance (Bryant 1979). For example, large-scale variation in the density of the Eurasian Curlew (*Numenius arquata*) is correlated with differences in the sizes of sediment particles (Yates et al. 1996) and populations of associated invertebrate prey (e.g., *Nereis diversicolor*) (Bryant 1979).

Consistent absence of curlews from some reaches of Humboldt Bay suggests that habitat quality and food availability in these areas were low. Curlews were often absent from low intertidal habitats in the center of the bay, which were exposed for shorter intervals than the high flats rimming the bay, thus affording less foraging time. Residency of curlews on low-tide feeding territories was correlated negatively with the height of low tide (Colwell and Mathis 2001). By extension, curlews were absent from the center of the bay because tides inundate these habitats sooner. Another possible explanation for the absence of curlews from these areas is that dense eelgrass beds, especially in South Bay (Barnhart et al. 1992), interfere with foraging by curlews. The patchy distribution of the Far Eastern Curlew (*N. madagascariensis*) in tidal habitats stemmed from lower densities in areas of denser sea grass (Congdon and Catterall 1994).

At the local scale, high curlew density (10–15 individuals) in the Elk River estuary was coupled with mostly (73%) uniform distributions. At this scale, a uniform distribution is widely recognized as a consequence of territoriality and the social interactions of neighbors. Individual curlews in the Elk River occurred consistently in the same locations (Colwell and Mathis 2001, Leeman et al. 2001) and were occasionally observed in territorial disputes with neighbors. On occasion (27%), curlews were distributed randomly in the estuary, and randomness tended to occur when more curlews (including occasionally nonterritorial immatures) were present during summer. These random patterns probably resulted when increased numbers of juveniles and other nonterritorial curlews (Colwell and Mathis 2001) overwhelmed the abilities of territorial birds to defend space. During the nonbreeding season, food is the resource that influences the expression of territorial behavior (Myers 1984). Goss-Custard (1985) suggested that territoriality is likely in habitats where food is moderately rich and predictable. We speculate that the uniform distributions are a consequence of the species' territorial social system at this site.

Territoriality has been reported for approximately 25% of shorebird species, but few taxa defend food resources within territories as large and for as long as curlews (Colwell 2000). Among species that defend long-term territories, similar distribution patterns have been noted and are correlated with food. For example, during the nonbreeding season, some Black-bellied Plovers (*Pluvialis squatarola*) defend territories (Turpie 1995). In South Africa, the plover is territorial where its main prey, the burrowing shrimp *Upogebia africana*, occurs in high density (Turpie 1995). These shrimp occupy permanent burrow systems. At the northern extreme of its winter range, where it feeds on polychaete worms (*Nereis diversicolor*), the Black-bellied Plover also defends territories (Turpie 1995). In the Elk River estuary (Leeman et al. 2001) and elsewhere in California (Stenzel et al. 1976), the curlew's diet consists of large prey such as burrow-dwelling shrimp similar to those eaten by territorial Black-bellied Plovers.

Uniform distributions may arise in species with social systems other than territoriality. At low tide, Eurasian Oystercatchers (*Haematopus ostralegus*) forage on mussels (*Mytilus edulis*) and establish dominance hierarchies. Individuals of high rank benefit by having priority of access to food (Ens and Cayford 1996). As a result, individuals avoid one another, also producing a uniform dispersion pattern (Vines 1980, Moody et al. 1997), albeit on a spatial scale finer than that we found with the Long-billed Curlew. We suggest that the distribution of prey influences curlews' territoriality and their local distributional patterns.

At the scale of the individual, Long-billed Curlews were distributed mostly in a uniform (75%) pattern within their territories, although some individuals foraged in a manner that produced random (16%) or aggregated (8%) patterns. Elsewhere, we have shown that this variation is correlated with diet (Colwell et al. 2002). Curlews forage for large prey by probing into the substrate or by pecking at the surface (Leeman et al. 2001). When diets consist of more bivalves, curlews tend to be uniformly distributed, whereas diets of mostly crabs produce aggregated patterns. Relationships between individual patterns of dispersion and diet may stem from the tendency for individuals to specialize for short intervals (2 hours) on prey captured by means of either tactile (bivalves, marine worms) or visual (crabs, shrimp, fishes) cues (Leeman et al. 2001). A negative correlation between distributions and foraging area further supports the contention that diet influences distributional patterns because individuals move more widely within their territories when feeding on crabs than when feeding on bivalves (Colwell et al. 2002).

At least one other shorebird, the Eurasian Oystercatcher, has been shown to exhibit fine-scale patterns of space use within territories (Hulsman et al. 1996). Female oystercatchers feed visually on large conspicuous prey (*Nereis*) and move greater distances than males from one prey capture to the next. By contrast, males tend to use tactile cues to detect prey (*Macoma*) and move shorter distances. Although Hulsman et al. (1996) did not quantify patterns of space use by Eurasian Oystercatchers, they suggested that tactile-feeding males are more aggregated whereas visual-feeding females are uniformly distributed in territories.

Although we lack data to evaluate the contributions of food and predation to the curlew's spatial distributions critically, we offer the following observations to suggest that predation is less important than food. First, as the largest Nearctic shorebird, the Long-billed Curlew is taken rarely by only the largest avian predators, such as the Red-tailed Hawk (*Buteo jamaicensis*; Dugger and Dugger 2002, Colwell pers. obs.). Second, we rarely observed curlews forming tight flocks characteristic of evasive behavior in response to avian predation; when they did it was for short intervals coinciding with an occurrence of the Peregrine Falcon (*Falco peregrinus*). Curlews have been observed feeding in loose flocks in pastures during winter when precipitation softens soils and makes earthworms more available (Colwell and Dodd 1995, Leeman and Colwell 2005). Potential predators of curlews are equally common and readily move between pasture and tidal habitats, hence differences in flocking behavior between habitats are more likely a consequence of food. Third, if predation influenced distributions, one would predict that curlews would be less numerous or would flock to a greater extent in habitats

offering limited visibility of approaching predators. But the curlew's highest densities and most uniform distributions occurred consistently in the Elk River estuary, where Peregrine Falcons only rarely surprised feeding curlews by approaching from fringing salt marsh and dunes near tidal flats (Colwell pers. obs.). In summary, predation may occasionally cause curlews to form transient tight flocks, but food probably exerts a stronger influence on the distribution of the Long-billed Curlew at Humboldt Bay.

Conservation Implications

On six occasions over two years, 200–300 curlews used intertidal habitats and pastures of Humboldt Bay. This value is similar to estimates of a decade earlier (Colwell 1994) and represents ~1% of the world's population (Brown et al. 2001). According to criteria used to recognize wetlands of significance to waterbirds (e.g., Ramsar Convention), this percentage supports recognition of Humboldt Bay under the Western Hemisphere Shorebird Reserve Network. The patchy distribution of the curlew suggests that protection of high-quality foraging habitats (e.g., Elk River estuary) may be warranted, especially where areas of high human use are nearby.

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Dusky Grouse (*Dendragapus obscurus*) along trail to Mt. Audubon, Roosevelt National Forest, Colorado, 24 September 2006, during a field trip from WFO's 31st annual meeting in Boulder, Colorado.

Photo by David Krueper

OCCURRENCE OF BRIDLED AND GRAY-BACKED TERNS IN AMERICAN SAMOA

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ABSTRACT: In the central Pacific, the Bridled Tern (*Sterna anaethetus*) and the Gray-backed Tern (*S. lunata*) are best distinguished by the pattern of the undersides of their primaries, largely white in the Gray-backed, contrastingly dark in the Bridled. In American Samoa, where the species' ranges overlap, their similarity in plumage may have led to confusion in early records of both species. During seabird surveys around Tutuila, American Samoa, in December 2003, I confirmed the presence of the Bridled Tern. I also review past sightings of the Gray-backed Tern in American Samoa.

The Gray-backed Tern (*Sterna lunata*) is endemic to the tropical and subtropical Pacific from the Northern Mariana Islands east to the Northwestern Hawaiian Islands and south through the Phoenix and Line Islands to the Tuamotu Islands (Clapp and Hatch 1986, Kessler 2003). The species also has been found at Easter Island and in the Marshall Islands, Society Islands, and Moluccas (Enticott and Tipling 1997). The world's breeding population of the Gray-backed Tern is estimated at 70,000 pairs, but the total population may be twice that size (Mostello et al. 2000). Very little is known about its migratory behavior.

The Bridled Tern (*S. anaethetus*) is a pantropical species with disjunct populations classified among four subspecies (Cramp 1983). Its world population probably exceeds 200,000 pairs, with a stronghold in the Persian Gulf, where 130,000 pairs may breed. The species is also found in Africa, India, Central America, northern South America, and West Indies. In the United States it occurs locally off the Florida Keys, regularly in summer in the Gulf of Mexico, and in the Gulf Stream north to North Carolina, rarely to New Jersey and, after tropical storms, to New England (del Hoyo et al. 1996). Vagrants have been reported from California, but it was not until 1998 that the first state record was accepted (Erickson and Hamilton 2001).

In the western Pacific the Bridled Tern occurs locally in Australia, Japan, the Philippines, China, and in the Pescadores, Ryukyu, and possibly the Senkaku Islands of Japan (Mostello et al. 2000). It is not known if the more northerly populations of the Bridled Tern in the western Pacific are migratory or where they spend the nonbreeding season (Clapp et al. 1993). In the tropical Pacific, the species is a common to abundant resident of Palau in western Micronesia; it is accidental at Bikar in the Marshall Islands in central Micronesia (Pratt et al. 1987). It also breeds in Fiji and New Caledonia (Bretagnolle and Benoit 1997). The Gray-backed Tern replaces the Bridled Tern in the central tropical Pacific (Mostello et al. 2000).

STATUS IN SAMOA

In American Samoa, the Gray-backed Tern breeds uncommonly. Amerson et al. (1982) reported 8 to 10 Gray-backed Terns in Fagatele Bay, Tutuila, on 17 February 1976. They reported about 100 birds seen in Larsen Bay in

March and July 1976 and that "their behavior suggested they were nesting there." In July 2000, P. O'Connor reported tens of Gray-backed Terns from various boat and shore surveys of Fagatele and Larsen bays in southwest Tutuila (O'Connor and Rauzon 2004). Gray-backed Terns have also been reported breeding at Annu'u Island, adjacent to Tutuila, and Rose Atoll, about 150 miles from Tutuila.

Until recently, the Bridled Tern was recorded around Samoa only as a vagrant at sea. Amerson et al. (1982) noted one record, one collection, and several sightings with no details. Grant and Trail (1993) reported the species from Pago Pago harbor and observed two pairs landing on ledges of the Pola (or Cockscomb), a conspicuous rocky promontory in the Tutuila unit of the National Park of American Samoa, but did not confirm breeding.

In 1996 and 1997, Bridled Terns were reported breeding on 'Upolu, Western Samoa, in three colonies (Tarburton 2001). Bridled Terns were also thought to be present in American Samoa in 2000, when P. O'Connor and J. Seamon (pers. comm.) made several sightings of "new" terns on trips to the Pola.

In December 2002, while conducting a seabird survey of Tutuila, I photographed Bridled Terns and estimated approximately 50 present at the Pola. At first I thought these birds were Gray-backed Terns because the only vocalizations I heard clearly sounded like the "churr" call of that species (Mostello et al. 2000). I photographed the terns in the harsh midday light (Figure 1) and clearly saw their dark backs. Later, from land, I saw Bridled Terns when the afternoon light was muted. Flying between the Pola and the

Figure 1. Bridled Terns (*Sterna anaethetus*) at the Pola, Tutuila, American Samoa, December 2003. Note the dark underside of the primaries, white forehead, and dark mantle.

Photo by Mark J. Rauzon

mainland were a pair of Bridled Terns; one chased a Brown Noddy (*Anous stolidus*), then landed on a cleft on the seawall on which grass grew. The tern slowly moved around it, and I saw the darker brown head, back, and wings, and noted that the bird's upright posture was like that of a Sooty Tern (*S. fuscata*), not angled and low like that of a Gray-backed Tern. This is a lesser-used but important field mark of the Gray-backed Tern (Pratt et al. 1987). I also saw another Bridled Tern flying along the shoreline of the island of Ta'u, about 70 miles from Tutuila, on 16 December 2002. In subsequent and extensive seabird surveys of Tutuila in September 2003 and on a brief visit in April 2004, I saw neither Bridled nor Gray-backed Terns.

IDENTIFICATION

There has always been confusion about the distributions in the central Pacific of the Bridled and Gray-backed Terns. Several authors have suspected that published records of the Bridled Tern from Hawaii, Samoa, Tonga, and Fiji may be based on confusion with the Gray-backed Tern (Pratt et al. 1987, Haney 1999). Identification challenges for observers trying to distinguish between the two species depend on whether a bird is viewed from below or above and on the harshness of sunlight (McKee and Erickson 2002). Distinguishing shades of brown and gray under a midday sun that lightens dark tones and darkens light tones can be difficult. To further complicate identification, there may be variation in the shade of brown of the upperparts in the western Pacific subspecies of the Bridled Tern, and nonbreeding adults

Figure 2: Gray-backed Tern (*Sterna lunata*) at Jarvis Island, April 1990. Note the reduced black visible on the primaries from under the wing but the darker upper surface of the primaries.

Photo by Mark J. Rauzon

may be paler than breeding adults (Haney et al. 1999).

The Bridled Tern, also known as the Brown-winged Tern, has brownish-black upperparts and tail (Endicott and Tipling 1997). Its upperwing is brown, darker on primaries and secondaries (Figure 1). However, heavily worn Gray-backed Terns at the beginning of prebasic molt also have a darker brownish cast on their outer secondary coverts (McKee and Erickson 2002), but the inner coverts and back remain medium gray, unlike the brownish gray back of the Bridled Tern (Figure 2). Gray-backed Terns have a distinct contrast between gray tertials and blackish primaries that is less obvious than on Bridled Terns. Gray-backed Terns also have less white in the outer rectrices than do Bridled Terns, but the amount of white also differs among subspecies of the Bridled (del Hoyo et al. 1996). Yet the outer rectrices have been used to distinguish between the Gray-backed Tern and North American races of the Bridled Tern in California (Erickson and Hamilton 2001).

Because determining dorsal coloration is problematic for terns flying overhead and the amount of white in the rectrices varies according to subspecies and molt, a diagnostic field mark more reliable than rectrix pattern is the extent to which the dark primaries contrast with the white underwings (Figure 3). Haney et al. (1999) noted that the Bridled Tern has white underwing coverts that contrast with the dark remiges, forming a dark border on the trailing edge of the wing and a wedge toward the wingtip. The darker underwing of the Bridled Tern thus differs from the mainly white underwing and brighter primaries of the Gray-backed Tern (Figure 4).

Figure 3. Bridled Tern at Kaba Point, Viti Levu, Fiji, 27 September 2003. Note the dark primaries as seen from below.

Photo by K. Vang and W. Dabrowka/Bird Explorers

Figure 4. Gray-backed Tern, Wake Atoll, November 2004.

Photo by David Boyle

In summary, I used underwing pattern and dorsal coloration to confirm the presence of the Bridled Tern in American Samoa in 2002. Breeding in American Samoa remains unconfirmed, but because the species has bred elsewhere in the Samoan Archipelago, it may be expanding its range into the national park. The Gray-backed Tern also occurs and may be outnumbered by the Bridled Tern in December.

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BOOK REVIEWS

The Shorebird Guide, by Michael O'Brien, Richard Crossley, and Kevin Karlson. 2006. Houghton Mifflin Company. 490 pages, 870 color photos. Paperback $24.95 (ISBN 0-618-43294-9).

Shorebirds are popular, and three new shorebird identification guides have appeared in the last year or so: this work, Message and Taylor's *Shorebirds of North America, Europe, and Asia* (reviewed below), and Paulson's *Shorebirds of North America* (reviewed in *Western Birds* 36:275–276, 2005). You may well ask, "Do we need all of these guides? Which one(s) should I buy?" The answer depends on what you want. Let's take a look at *The Shorebird Guide*.

Birds in life rarely look like "the picture in the book," no matter how good that picture is, be it a painted illustration or photo. So this excellent photo-driven guide focuses on identifying shorebirds as one sees them in the field—by using size, structure, behavior, and general color patterns—rather than by fine-level plumage details (although these are also noted). It's an approach different from that of most field guides, but it's the way by which experienced birders identify much of what they see. The authors' premise is that identification can be made easier by looking at those features that are least variable yet most visible in the field. Learning to see the whole as being composed of more than its constituent parts is an approach that we all use to some degree, and *The Shorebird Guide* aims to hone this inherent capability. It's a worthy goal, but not one easy to achieve. The preface outlines this approach, then come acknowledgments, introduction, 293 pages of color "species photos" (with range maps and brief text), and the species accounts; the book ends with an appendix, glossary, short bibliography, photo credits, and index. Species names for both photos and text are given at the bottom of each page, making it easy to flip through and find something.

The thoughtful 22-page introduction puts shorebirds in a taxonomic context, briefly notes migration and conservation issues, and then discusses how to identify shorebirds. Pointers for evaluating and describing relative size, structure, behavior, general color patterns, voice, and plumage details are followed by caveats about lighting conditions, variation, and the importance of probability. Shorebird topography is dealt with by means of three labeled photos. Given the importance of understanding the various groups of feathers, this section is too brief and is not helped by some misleading labels (e.g., for the median coverts); at the very least the user should be referred to the glossary for explanations of terms. The glossary, however, refers to upper and lower rows of scapulars, which might better be called bands, or simply upper and lower scapulars, given that the scapulars originate from a single strip or patch and fan out rather like stalks of different lengths in a vase of flowers. Molt and age determination are explained clearly, using photos of the Western Sandpiper and Greater Yellowlegs to illustrate seasonal changes in appearance; the familiar life-year terms such as breeding adult, first winter, etc., are used for plumages in favor of more technical (and less field-friendly) terms such as definitive alternate, formative, etc. This is a good decision, given how often I see birders mistakenly describe sandpipers in first alternate plumage as being in basic plumage simply because they are in a dull plumage. Following the introduction come four pages that explain how to use *The Shorebird Guide*.

The species photos start with 47 "domestic species," then come 44 "rarities and regional specialties" (e.g., the Bar-tailed Godwit and Red-necked Stint), and finally five instructive pages showing presumed hybrids. Divvying up the species in this way may be more helpful for beginners (at least those living outside western Alaska), but it took me a while to get used to looking in different places for related species. The species accounts, by contrast, have all species together in taxonomic sequence. Photos are the crux of this guide and overall they are superb, well chosen, and well reproduced. They combine utility and aesthetics and range from small (but identifiable) images of

the relevant species, often with other species for comparison, to full-page photos that help evoke the magic and beauty of shorebirds, such as ones of the American Avocet (p. 77) and a "rush" of Red Knots and Ruddy Turnstones (p. 138). The photos of "domestic" species start with a "character photo" showing each species in some typical pose or setting, and all species progress from juvenile to adult with accompanying captions that highlight characters for age and species determination. Rarities have fewer photos (and shorter species accounts), which makes sense given that most users won't see (let alone find) rare shorebirds.

Many photos show two or more species (not always other shorebirds), which replicates real-life birding and is also helpful for appreciating relative size and structure. Taken together the photos give an excellent feel for each species, which would not be the case if only portraits were used. All "other" species in each photo (even those out of focus in the background) are identified, the only exceptions I found being the juvenile Laughing Gull flying in photo 20 on p. 200 and the background Stilt Sandpiper in photo 9 on p. 197. The photos do not necessarily cover the range of plumage variation for each age group (e.g., as in first-summer Black-bellied Plovers, which range in appearance from nonbreeding to full breeding plumage), but the species accounts do note these variations. A nice touch, characteristic of the book's teaching approach, is the regular inclusion of quizzes asking the reader to identify the species or age of birds shown (answers, with explanations, are in the appendix). Making people think by answering questions on the basis of information just presented is a great way to promote learning. Simply scanning captions may not lead to absorbing information.

Perhaps inevitably with so many photos, there are minor errors and glitches. For example, in photo 3, p. 51, the juvenile is on the left, not right. The "molting adult" Surfbird in April (photo 5, p. 132) is in its first spring (note the relatively brown and pointed primaries), but the caption says "mostly worn breeding [plumage]," so something is amiss. The "nonbreeding" Little Ringed Plover (photo 5, p. 242) is a juvenile. An unfortunate typo is that for the juvenile Black Turnstone (p. 128), which was photographed in early September, not November (this species molts out of juvenal plumage quickly and is difficult to age in the field by early winter). The only species-level misidentification I found was of the Black-headed (not Little) Gulls in the background of photo 1, p. 227. Notable omissions from the photos are subspecies *frazari* of the American Oystercatcher and the juvenile Bristle-thighed Curlew.

At the start of each species' photo section is a range map and a short text indicating size (including helpful comparisons to other species, e.g., the Buff-breasted Sandpiper is "same as a small Pectoral Sandpiper"), structure (often with comparison to similar species), behavior (including habitat), and a précis of status in North America. These notes, taken with the photos and captions, should allow all species to be identified. One could disagree with little points, such as the legs of Snowy Plovers reportedly being only occasionally tinged pinkish (they usually look tinged pinkish, at least in California). The maps, which come at the start of each species' photo section, are taken from the Kaufmann *Focus Guide to Birds of North America* and are not always accurate or up to date. For example, the recent breeding of the Mountain Plover in northeastern Mexico is not mapped (albeit outside the book's geographic scope), and the breeding of the Black-necked Stilt and the marked spring passage of the Whimbrel and Hudsonian Godwit in south-central Alberta (Ray Wershler pers. comm.) are not indicated.

The species accounts cover status, taxonomy, behavior (including habitat), migration, molt, and vocalizations. These accounts are intended as identification-related information to supplement that provided in the photographic section and are generally sound and well-written, but I lament the lack of literature citations. The behavior section gives such information on breeding as timing, number of broods, and fledging dates (eggs are not described), as well as feeding behavior and both breeding and nonbreeding habitats. Given the depth of these accounts I found some surprising omissions. For

example, no mention is made of the frequent occurrence (at least along the Pacific coast) of Whimbrels feeding and roosting on rocky coastlines, and the distinctive species-specific feeding habits of the Snowy, Wilson's, and Semipalmated plovers are not described, although the birds' spacing and manner of foraging can be used to identify each species at long range. The nesting season given for the Collared Plover in Mexico (August to November; no references) is at odds with published and unpublished data for nests and young of which I am aware, April–July and November–December, and mentioning putative seasonal abundance shifts for this species in Chile without references is unhelpful. The migration section details spring and fall dates in different regions and distinguishes between the schedules of adults and juveniles in fall. I'm sure careful observers will find discrepancies for their own regions; for example, the first juvenile Semiplamated Plovers reportedly arrive in the northern tier of states in mid August, yet they appear regularly in central California by late July (pers. obs.), and photo 3 on p. 51 shows a juvenile in late July in New York. But overall this is excellent (if unreferenced) information very helpful for identification.

The accounts for the timing and extent of molts, and whether they occur on breeding, stopover, or nonbreeding grounds, are written clearly and logically, following a bird from juvenal into adult plumage. A careful reading, however, reveals not infrequent errors about timing and extent of molt, and the lack of citations leaves the user nowhere to follow up. For example, Mountain Plovers have a variable preformative molt (P. Pyle and S. N. G. Howell unpubl. data) rather than lacking one, as *The Shorebird Guide* states. And adult western Willets are still undergoing primary molt in northern Chile (not acknowledged as part of their winter range) in mid November (pers. obs.) even though *The Shorebird Guide* reports this molt being completed by early September.

All in all, though, my criticisms of this work are of the inevitable nit-picky kind, and the authors have provided a superb overview of North American shorebird identification that will benefit beginner and expert alike. Put simply, this is a must-have volume for anyone interested in shorebirds.

Steve N. G. Howell

FEATURED PHOTO

STAFFELMAUSER AND OTHER ADAPTIVE STRATEGIES FOR WING MOLT IN LARGER BIRDS

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The remiges (primaries and secondaries) of birds take a relatively long time to develop. Growth rates of primaries, for example, can vary from 3.2 mm per day in smaller birds to 6.3 mm per day in larger birds, but the summed lengths of all primaries can be as much as ten times greater in larger birds than in smaller birds (Rohwer 1999). Most passerines and other smaller birds replace all primaries sequentially from the innermost (p1) to the outermost (p9 or p10) and maintain the ability to fly, but most larger birds lack the time (between periods of breeding and migration) to follow this sequence within a single molt and have evolved alternative strategies.

Some large birds that can forage and avoid predation without flying replace all of their remiges synchronously. They become flightless during the prebasic molt but, by doing so, substantially reduce the time it would take to replace each feather sequentially. Loons, grebes, anhingas, some sea ducks, and some alcids follow this strategy, diving underwater when flightless to feed and avoid predation. Other waterfowl and flamingos store nutrients and congregate at remote locations, such as the middle of large lakes or marshes, to complete rapid synchronous wing molts within two to three weeks. Rails, coots, and some cranes find impenetrable areas, and adult Bristle-thighed Curlews (*Numenius tahitiensis*) migrate to predator-free islands to undergo synchronous remigial molts.

However, many large birds that lack the time for a sequential replacement of remiges cannot afford to become flightless. Because of constraints on feather-growth rates, the replacement of two or three adjacent remiges in quick succession can leave large gaps in the wings, inhibiting flight (Tucker 1991, Hederström and Sunada 1999), so simply accelerating the rate at which feathers are molted may not provide a solution. Rather, most of these species have evolved strategies in which remiges at disjunct locations are replaced at the same time, producing multiple smaller gaps while maintaining the wing's surface integrity and the bird's ability to fly.

One such strategy involves "multiple molt series," including both proximal (inward or centripetal) and distal (outward or centrifugal) replacement from one or more focal points within the remiges. In falcons, for example, the primaries and secondaries are each replaced "inside out" from foci at p4/p5 and s4/s5 (Miller 1941), resulting in four small gaps during remigial molt and enabling the replacement of all remiges within a single prebasic molt (Pyle 2005). Other birds that molt in multiple series in all or part of the remiges include albatrosses (Langston and Rohwer 1995, Howell 2006), parrots (Dickey and van Rossem 1938), some cuckoos (Pyle 1997a), owls (Pyle 1997b), some kingfishers (Hanmer 1980), and puffbirds (Dickey and van Rossem 1938). This strategy adjusts the frequency of feather replacement to the rate of feather wear, so that all feathers are replaced when needed, resulting in relatively even amounts of wear among multiple feather tracts (Rohwer 1999).

Staffelmauser

Along with synchronous molt, the most common strategy for replacing remiges among large birds is "*Staffelmauser*," a German word meaning "staggered molt" introduced by German ornithologists Stresemann and Stresemann (1966). It is also known as "stepwise" or "serial" molt. *Staffelmauser* typically begins with an incomplete second prebasic molt, during which primary replacement proceeds distally from

p1 (Figure 1), as in smaller birds, but then arrests before all feathers are replaced (Figure 1A). The bird thus retains its juvenal outer primaries for another molt cycle, which equates to an additional year in most North American species. The next prebasic molt begins where the previous molt left off the year before, while another sequence commences again from p1, thus resulting in two "waves" of simultaneous primary replacement (Figure 1B). Often, especially in the largest of birds, this molt still does not result in all ten juvenal primaries being replaced. The outermost wave may, for example, stop at p9 (Figure 1C), such that the next molt begins with three waves, commencing at p1, the point after which the proximal molt was arrested (p5 in the example shown in Figure 1C), and p10. As long as fewer than all ten primaries are replaced during each molt, this strategy eventually results in multiple waves of molt (and generations of feathers) within the primaries (Figure 1D).

The top photograph on this issue's back cover shows *Staffelmauser* among the remiges of a Swainson's Hawk (*Buteo swainsoni*) captured for banding near Raymondville, Texas, in March 2003. Among the ten primaries, the most recent molt included p2–p3 and p5–p8, leaving p1, p4, and p9–p10 as older and more worn feathers of a previous generation; once multiple waves have been established, p1 may or may not be replaced every year. This hawk thus displayed three feather "sets" between waves of distally oriented molts: p1–p3, p4–p8, and p9–p10. Within each set, outer feathers are sequentially fresher than inner feathers, even though the sets represent more than one cycle of molt. Provided that (1) no more than ten primaries are replaced during a single molt, (2) each primary is molted only once per year, and (3) the first replacement of primaries takes place during the second prebasic molt, the minimum age of birds following *Staffelmauser* is reflected by the number of molt sets in the primaries (Pyle 2005). Thus this Swainson's Hawk is at least three years old. Most species of *Buteo* can show three sets, and some individuals can show four (e.g., Figure 1D) or even five sets of primaries, allowing the determination of minimum age of birds up to five years old (Pyle 2005). At the same time, however, waves can "catch up" to each other, and under favorable circumstances some individuals may undergo a complete annual molt, obscuring *Staffelmauser* patterns and reducing our ability to determine minimum ages. For example, the Great Blue Heron (*Ardea herodias*) featured on the back cover, photographed at Jasper Ridge, California, 18 April 1988, shows just two sets of nonjuvenal feathers among the primaries, p1–p2 and p3–p10. Thus it is at least two years old, even though it is probably older (see below).

Whereas *Staffelmauser* among primaries has been studied in many species, concurrent patterns of replacement among secondaries are poorly documented. Unlike primaries, which molt in only one repeated series (p1 to p10), secondaries molt in as many as three series, which commence at three foci and proceed in different

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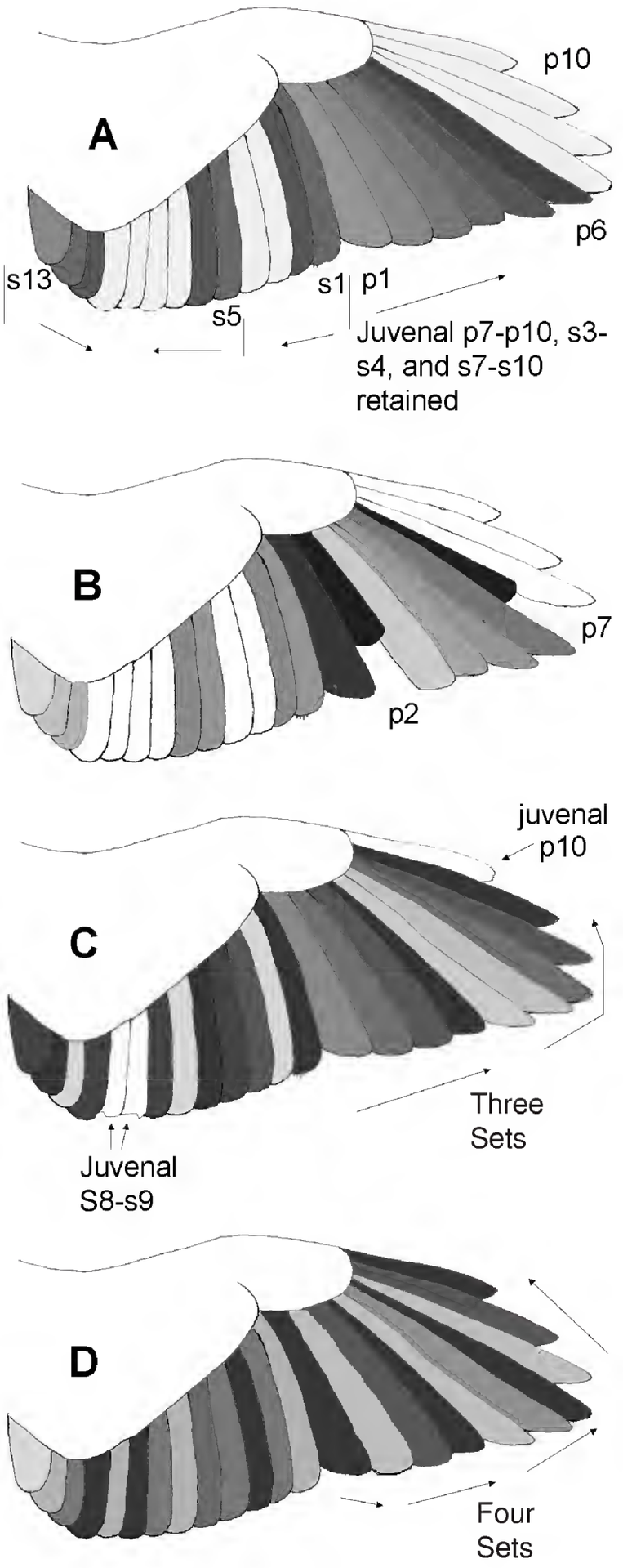
Figure 1. Examples of *Staffelmauser* molt patterns in large birds. Darker shading indicates more recently replaced feathers; whiter shading indicates older feathers. *Staffelmauser* usually begins with an incomplete second prebasic molt, in which some secondaries and outer primaries are retained (A). During the third prebasic molt, replacement of remiges continues in sequence and at the same time begins anew, resulting in two "waves" of primary molt (B). In large birds this third prebasic molt may still not result in all juvenal primaries and secondaries being replaced (C), resulting in three waves of primary molt at the commencement of the fourth prebasic molt. After definitive prebasic molts, up to four or five "sets" (blocks of feathers between waves) can be identified between waves of molt (D), with the number of sets reflecting the minimum age of the bird. Because molts are protracted, a gradation from fresher feathers basally to more worn feathers distally can be identified within each set. Molt of secondaries shows multiple replacement series, commencing at foci at s1, s5, and the tertials (see text).


A
p10
p6
s13
s1
p1
s5
Juvenal p7-p10, s3-s4, and s7-s10 retained
B
p7
p2
C
juvenal p10
Three Sets
Juvenal S8-s9
D
Four Sets

directions. This complicates analysis of feather replacement, especially after one or two molts have taken place. To understand strategies of secondary replacement, I examined hundreds of specimens showing *Staffelmauser* and was able to identify rules consistent across families.

The secondaries of most large birds are replaced sequentially, proximally from the outermost feather (s1), proximally from s5, and distally from the tertials (Figure 1A), no matter the number of secondaries (*cf.* Edwards and Rohwer 2005). The focus at s5 may relate to "dyastataxy," the evolutionary "loss" of a feather at this position, which is widespread in large species of birds (Miller 1941, Bostwick and Brady 2002). Thus, after the second prebasic molt, the last juvenal feathers in this sequence are often retained, among s3–s4, and among s8–s15 in species (including many large birds) that have 12–21 secondaries (Figure 1A). As with the primaries, subsequent molts of secondaries begin where the preceding molt arrested, while at the same time new waves begin, although not always commencing at all three foci every year. After two or more molts, variation in the number of secondaries replaced, combined with the complex sequence of replacement, can produce a variable array of possible patterns (Figure 1C–D), often interpreted as random (Siegfried 1971, Prevost 1983, Schreiber et al. 1989), even though the above rules and series appear to remain intact.

Thus, even though the Swainson's Hawk on the back cover is at least three years old, its pattern of feather wear implies proximally replaced sets of secondaries at s1–s2, s3–s4, and s5–s8, and a distally replaced set that includes at least s12–s10. It appears that among s1–s4 all four feathers were replaced during the preceding molt, but that s3 was replaced before s2, marking the resumption of a wave at s3, while another wave commenced at s1 and "caught up" to the set at s3–s4. By contrast, s5–s6 and s9 were retained during the previous molt, s9 representing the convergence between distal and proximal waves. On the Great Blue Heron's left wing, proximal sets can be identified at s1–s2, s3–s4, and s5–s6, and distal sets can be identified at s16–s12 and s11–s10. The right wing is similar except that the distal sets appear to be at s16–s13 and s12–s10, indicating that s12 had been replaced on the right wing but not on the left during the previous molt. On both wings, s7–s9, located at the convergence between the proximal and distal waves, had been retained during the previous molt. S8 on the right wing had likely been lost accidentally (Great Blue Herons should not be molting in April; Pyle and Howell 2004), although its unseasonal regrowth may influence subsequent patterns of feather replacement. (Strong asymmetry between the wings occurs at times and may indicate previous adventitious loss that disrupted the sequence in one wing.) This pattern, with several sets of nonjuvenal feathers among the secondaries, probably indicates an individual at least three or four years old, but more study is needed to document this.

Molt Terminology

Staffelmauser has presented a challenge to those attempting to apply the Humphrey and Parkes (1959) molt terminology (e.g., Schreiber et al. 1989, Filardi and Rohwer 2001). In species with prealternate molts, replacement of remiges can be protracted and overlap both the prebasic and prealternate body molts. In species lacking prealternate molts, replacement of feathers retained during previous molts can be considered either as part of the ongoing prebasic molt or as part of a protracted version of the prebasic molt in which other feathers of the same generation were replaced. For example, replacement of the juvenal p10 in Figure 1C might be considered either part of the second prebasic molt, in which three years were needed to complete replacement of all juvenal remiges, or part of the fourth prebasic molt, underway in the contour feathers at the time this primary is replaced.

Unless remiges are replaced twice during a molt cycle, by definition all replacement should be considered part of a prebasic rather than a prealternate molt (Humphrey and Parkes 1959). *Staffelmauser* in species with and without a prealternate molt

is parallel, suggesting that it evolved from a common ancestor and thus should be presumed homologous with a prebasic rather than a prealternate molt (see below). Furthermore, because it appears that fewer than all remiges are typically replaced during *Staffelmauser* (Pyle 2005), I propose that all replacement of remiges be considered part of the "incomplete" prebasic molt occurring at the time of replacement. Thus replacement of p10 in Figure 1C would be considered part of an incomplete fourth prebasic molt, rather than part of a complete but protracted second prebasic molt. This interpretation yields a clearer definition of each feather's generation than does the alternative nomenclature, because determining the number of times a feather has molted is not possible once all juvenal feathers have been replaced. Difficulties in this interpretation may arise only in species that can replace remiges more than once during a single prebasic molt, as appears to be the case during the second prebasic molt in New-World vultures (M. Flannery pers. comm.) and perhaps the White-tailed Hawk (*Buteo albicaudatus*; W. S. Clark pers. comm.).

Evolution and Adaptive Benefits of *Staffelmauser*

Staffelmauser occurs in a wide diversity of North American birds, including tropicbirds (pers. obs.), boobies (e.g., Dorward 1962), pelicans (e.g., Schreiber et al. 1989), cormorants (e.g., Filardi and Rohwer 2001), frigatebirds (pers. obs.), bitterns (pers. obs.), most herons and egrets (e.g., Siegfried 1971, Shugart and Rohwer 1996), storks (Sutter 1984 in Rohwer 1999, pers. obs.), condors (Snyder et al.1987), ospreys (Prevost 1983), hawks and eagles (e.g., Bloom and Clark 2001, Clark 2004, Pyle 2005), chachalacas (pers. obs.), some cranes (see below), and some tropical terns (Dorward and Ashmole 1963, Ashmole 1968). In other tern species, the two or three additional, arrested waves of primary replacement, which can occur *within* a single molt cycle (*cf.* Ward et al. 2004), may represent a derived strategy of incomplete replacement, evolved from the *Staffelmauser* of ancestral tropical species (S. N. G. Howell). More difficult to explain, evolutionarily, is the molt pattern of the Limpkin (*Aramus guarauna*), which appears to undergo *Staffelmauser* but in the direction opposite that of other species (pers. obs. of specimens in U.S. National Museum), the primaries being replaced proximally from p10 to p1 and the secondaries being replaced distally from s5 and both proximally and distally from a focus among s8–s12!

Not all species of all of these groups exhibit *Staffelmauser*, and even within species the proportion of individuals following this strategy can vary (*cf.* Pyle 2005). Most intriguing are the molt strategies of the Sandhill Crane (*Grus canadensis*), in which resident southern subspecies follow *Staffelmauser* but most individuals of migratory boreal subspecies undergo synchronous molt of remiges (Nesbitt 1987, Nesbitt and Schwickert 2005, pers. obs.). In addition, *Staffelmauser* can occur occasionally in species that do not typically employ this strategy, such as in a White-tipped Dove (*Leptotila verrauxi*) I examined during banding at Tepotzlán, Mexico, in May 2004 and some Common Poorwills (*Phalaenoptilus nuttallii*) at high elevations (S. Rohwer pers. comm.). Unlike multiple replacement series, *Staffelmauser* thus appears not to be an independently derived strategy but rather an adaptive adjustment to the ancestral complete prebasic molt based on environmental constraints.

Two adaptive mechanisms have been proposed to explain *Staffelmauser*, the "time-constraints hypothesis" (Shugart and Rohwer 1996), in which *Staffelmauser* results simply from a lack of time to replace all feathers, and the "aerodynamic hypothesis" (Stresemann and Stresemann 1966, Tucker 1991, Hederström and Sunada 1999), in which it has evolved to replace as many feathers as possible without inhibiting flight efficiency. These two explanations are not necessarily mutually exclusive: time constraints may have provided the proximate cause for the evolution of *Staffelmauser*, whereas flight efficiency is an ultimate adaptive benefit (Pyle 2005). In other words, the ultimate result of *Staffelmauser*, multiple small gaps in the wing,

may have reduced pressure to adapt a strategy that includes multiple molt series, a greater departure from ancestral strategies and thus less likely to evolve. An argument against *Staffelmauser*, that the more exposed outer primaries are replaced less often, seems to have been compensated by the addition of increased melanin to these feathers, creating a feather more durable than the inner primaries and perhaps explaining the subtly darker wing tips often observed in species that have adopted *Staffelmauser*. To confirm such hypotheses and investigate other evolutionary pathways of molt it would be interesting to perform parsimony analysis of molt strategies relative to proposed phylogenies, as done by Bostwick and Brady (2002) to investigate the evolution of diastataxy.

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31ST ANNUAL WFO CONFERENCE, BOULDER, COLORADO: RETROSPECTIVE

The 31st annual conference of Western Field Ornithologists met with tremendous success. In Boulder, Colorado, 21–24 September 2006, the 114 attendees enjoyed four stimulating days of scientific paper sessions, workshops, panels, field trips, and camaraderie.

Organizational Business

The membership approved modifications of the WFO bylaws setting term-limits for directors and increasing their number. The board—especially Bylaws Committee chair Gjon Hazard—had worked for months with diligence and care on these amendments. We hope that the term limits and board expansion will broaden participation, enhance our effectiveness, and further our organizational reach.

Elisabeth Ammon, Carol Beardmore, and Jon Dunn were elected to fill the three new directors' positions. Dave Krueper assumed the role of WFO president; Catherine Waters was elected vice-president. Outgoing president David Yee was thanked for his years of dedicated service to the organization and was acknowledged for his considerable accomplishments as president.

Scientific Program

The scientific paper sessions, moderated by Jay Withgott, featured 26 presentations by field ornithologists from 10 states and 3 countries. The title and presenter of each talk is listed below. Abstracts (with all authors) of these papers are archived and downloadable at the WFO website: www.wfo-cbrc.org/confer_2006_abstracts.doc.

Ammon, Elisabeth M.: *Coordinated landbird monitoring in Nevada: Lessons learned.*

Anderson, Hannah E.: *The effects of internal edges and non-native shrubs on Streaked Horned Lark nest predation.*

Diaz, Luis Adrian: *Long-distance migratory birds as viral agents dispersers: Dogma or fact?*

Farmer, Adrian: *Determining shorebird wintering locations in Argentina using stable isotopes and trace elements: Problems and promises.*

Faulkner, Doug: *Pelagic mega-rarities of Wyoming.*

Francis, Clinton D.: *Avian community nest-site selection within piñon–juniper woodlands in northwest New Mexico.*

Ghalambor, Cameron K.: *Avian parental care under the risk of nest predation: General patterns and exceptions.*

Gill, Robert E.: *Isn't technology grand?: Satellite tracking of Bar-tailed Godwits and Bristle-thighed Curlews between hemispheres.*

Harness, Richard E.: *Development and deployment of a Bird Strike Indicator (BSI).*

Kotliar, Natasha: *Avifaunal responses to fire along a burn-severity gradient in montane and subalpine forests of the Rocky Mountains.*

McIsaac, Hugh: *Prairie Falcon attack methods and success rates against pigeons.*

Moskwik, Matthew: *Male and female reproductive strategies in the polygynous Bobolink.*

Nemeth, Nicole: *Avian immunity to West Nile Virus.*

Nielsen, Lori A.: *Clear Channel of Northern Colorado Slab Canyon KQLF-FM Avian Monitoring Project.*

Oesterle, Paul: *Cliff Swallows as a sentinel in West Nile Virus surveillance.*

Oyler-McCance, Sara J.: *A rangewide genetic comparison of Trumpeter Swans using mitochondrial and nuclear markers.*

Potter, Kim, and Rich Levad: *Distribution, abundance, and nest-site characteristics of Black Swifts in the southern Rocky Mountains.*

Ryan, Thomas: *Habitat preferences of California Least Terns nesting in a human-dominated landscape in Venice Beach, California.*

Skagen, Susan K.: *Fecundity and juvenile survival in Lark Buntings: Insights into population declines.*

Smithson, Scott: *Breeding biology and habitat use of the Orange Bishop and the Nutmeg Mannikin in southern California.*

Sparks, Rob: *Analysis of vegetation data for monitoring breeding birds in the short-grass prairie (BCR 18): Cassin's Sparrow.*

Swanson, Heather: *Forestry, agriculture, and recreational development effects on birds of Boulder Open Space: Using science to inform management decisions.*

Swanson, Heather: *Defenses of American Robins against brood parasitism along an elevational gradient.*

Tuff, Ty: *Nest defense and nest attentiveness may explain differential parasitism frequencies in two suitable cowbird hosts.*

Utt, Amy C.: *The effects of rearing method on social behaviors of mentored captive-reared juvenile California Condors.*

Utt, Amy C.: *Factors associated with behavioral problems and survival following release of captive-reared California Condors.*

Our keynote speaker, Jessica Young of Western State College in Gunnison, Colorado, gave a fascinating overview of the discovery, behavioral ecology, and management of the Gunnison Sage-Grouse. This grouse was recently named a new species following research by Dr. Young and her colleagues. Dr. Young explained why grassland lekking species may diverge and speciate rapidly yet also be susceptible to extinction, and she illuminated current conservation challenges.

Workshops and Panels

Our three workshops received rave reviews from their participants. Bill Schmoker shared his tricks of the trade in digital photography, while Arch McCallum illuminated *Empidonax* flycatcher identification and the spectrographic analysis of bird vocalizations.

Two expert panels took their best shots at identifying mystery sounds and slides before a rapt audience. Slide-panel moderator Joe Morlan and sound-panel moderator Nathan Pieplow selected challenges that made for fascinating discussion and a valuable learning experience for all.

In a third panel, members from four state bird records committees, moderated by Kimball Garrett, emphasized how the primary role of these committees is not to render judgment on birders' sightings but to archive sightings to help build a better understanding of a state's avifauna.

Field Trips

The four days of field trips ranged throughout the Boulder region and into Wyoming. Despite some wintry weather, participants recorded at least 194 species. Highlights included Colorado specialties such as the White-tailed Ptarmigan, Dusky Grouse, American Three-toed Woodpecker, McCown's Longspur, Chestnut-collared Longspur, and Brown-capped Rosy-Finch; shorebirds including the American Golden Plover, Stilt Sandpiper, and Buff-breasted Sandpiper; vagrant passerines such as the Magnolia Warbler, Palm Warbler, and Field Sparrow; and rare fall migrants such as the Broad-winged Hawk and Sabine's Gull. Western birders also delighted in many common eastern species, from the Blue Jay to Eastern Screech-Owl.

WFO Thanks You!

We thank the many people (besides those mentioned above) who contributed to the conference's success, including Larry Allen, Andy Boyce, Richard Delavega, Bob Evans, Doug Faulkner, Robbie Fischer, Mike Freiberg, Allison Hilf, Nick Komar, Tony Leukering, Norm Lewis, Chuck Otte, Mark Peterson, Mike San Miguel, Ari Rubin, Larry Semo, Scott Severs, Kei Sochi, Andrew Spencer, Robert Waters, and Colorado Field Ornithologists.

Looking Ahead to Next Year

Next year's WFO conference will be held 27–30 September 2007 in Las Vegas, Nevada, and will be hosted by Red Rock Audubon Society. Mark your calendars and come join us!

Ted Floyd, Catherine Waters, and Jay Withgott

Crested Auklets (*Aethia cristatella*) engaged in ruff-sniff display, Kiska Island, Alaska, June 2002.

Photo by Ian L. Jones

Color printing of the inside covers of this issue of *Western Birds* generously sponsored by Crest Offset Printing, 921 Coolidge Ave., National City, CA 91950.

Back cover "Featured Photos" by © Bill Clark of Harlingen, Texas: Swainson's Hawk (*Buteo swainsoni*), March 2003 (top); and © Peter LaTourrette of Los Altos, California: Great Blue Heron (*Ardea herodias*), April 1988 (bottom).

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Front cover photo by © Bob Steele of Inyokern, California: Upland Sandpiper (*Bartramia longicauda*), Galileo Hill, Kern County, California, 4 June 2006.

Western Specialty:
Townsend's Warbler

Photo by © Robert A. Hamilton of Long Beach, California:
Townsend's Warbler (*Dendroica townsendi*)
La Salina, Baja California, October 2004.

WESTERN BIRDS

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SEABIRDS IN THE NORTHERN GULF OF ALASKA AND ADJACENT WATERS, OCTOBER TO MAY

ROBERT H. DAY, ABR, Inc.—Environmental Research & Services, P. O. Box 80410, Fairbanks, Alaska 99708-0410; bday@abrinc.com

ABSTRACT: I studied the distribution and abundance of seabirds in the northern Gulf of Alaska and adjacent waters during 16 research cruises from October to May 1997–2001. I recorded 58 species of seabirds on transects, plus one off the transects. The avifauna was dominated numerically by tubenoses (50% of all birds) and alcids (29%), with much smaller numbers of larids (3%), shorebirds (phalaropes; 3%), waterfowl (2%), cormorants (1%), and loons (<1%). Five species each composed ≥5%, and collectively composed 74%, of the wintering avifauna: the Common Murre (*Uria aalge*; 21%), Northern Fulmar (*Fulmarus glacialis*; 19%), Fork-tailed Storm-Petrel (*Oceanodroma furcata*; 16%), Sooty Shearwater (*Puffinus griseus*; 11%), and Black-legged Kittiwake (*Rissa tridactyla*; 7%). Another nine species collectively composed ~19% of all birds, whereas the other 44 species collectively composed ~7% of all birds. I recorded from 10 to 37 species per cruise; both the number of species and total density of all birds combined decreased from October to March, then increased rapidly in April and (especially) May.

The Gulf of Alaska supports enormous numbers of marine birds, with over 9 million nesting there (Gould et al. 1982, DeGange and Sanger 1986). Up to 40 million feed in the gulf during the summer; in winter, numbers are lower (Gould et al. 1982).

This study investigated some aspects of seabird ecology during a period (nonbreeding) that may affect their populations strongly (Bailey and Davenport 1972, Harrington-Tweit 1979, Blake 1984, Harris 1984, Hope Jones et al. 1984). I studied variation in the abundance of seabirds in the northern Gulf of Alaska from October to May, the nonbreeding period, through four consecutive years (1997–2001). These data on the distribution and abundance of seabirds during this time represent the first step in understanding the ecology of these predators at this high latitude.

Although seabirds have been studied in the Gulf of Alaska for >30 years, few data actually are available for comparison with this study. For example, Gould et al. (1982) presented data by season, but few are available for most months and for particular locations within this region. In addition, one of three multiyear studies of wintering-seabird abundance in this region has

been conducted within protected bays around Kodiak Island since the late 1970s (Forsell and Gould 1981; D. Zwiefelhofer, U.S. Fish and Wildlife Service, pers. comm.). The other two studies comparing year-to-year variation in bird abundance, including winter, were conducted after the *Exxon Valdez* oil spill and were focused on Prince William Sound (e.g., Wiens et al. 1996, Day et al. 1997a, b, Murphy et al. 1997, Lance et al. 1999, Irons et al. 2000). None of these studies, however, addressed the wintering ecology of seabirds in the open northern Gulf of Alaska; furthermore, only one (Day et al. 1997a) examined birds in the gulf itself, and that was only within bays during the summer. Agler et al. (1995) studied birds in the fairly protected lower Cook Inlet in February and March of one winter.

STUDY AREA

My study area encompassed the northern Gulf of Alaska, both neritic and oceanic, and nearby Prince William Sound (Figure 1). It included the 220-km-long Seward Line, a large oceanographic survey line that extends across the continental shelf and slope, and several other oceanographic lines that sampled the shelf and the Alaska Coastal Current in the gulf and within Prince William Sound.

Several structures and water masses characterize the region's physical oceanography. From inshore to offshore, these are the Alaska Coastal Current, the mid-shelf region, the shelf-break front, and the Alaska Current/Alaska Stream (Figure 1). In fall and winter, storms enter the gulf, are blocked by the coastal mountains, and drop precipitation that forms an enormous freshwater "river" (the Alaska Coastal Current) that flows northwest along the coast (Royer 1979, 1982). These storms also generate a cyclonic circulation over the shelf and continental slope, resulting in downwelling most of the time (Reed and Schumacher 1986).

The Alaska Coastal Current is the most prominent feature of ocean circulation over the Gulf of Alaska's continental shelf (Figure 1); it is a fast current of low salinity that typically flows within 35 km of the coast. It varies in width seasonally, being wider in the fall and early winter and narrower in late winter and spring (Royer 1981a, b, Johnson et al. 1988). Part of the Alaska Coastal Current loops through southern Prince William Sound (Niebauer et al. 1994); occasionally, jets of water from the coastal current (indicated by dashed lines in Figure 1) are forced offshore at coastal promontories. In the mid-shelf region, the water moves much more slowly than in both the inshore Alaska Coastal Current and the offshore Alaska Current/Stream, both of which flow strongly to the west (Niebauer et al. 1981, Royer 1981a, Lagerloef 1983). The shelf-break region is an area of complex physics, and the dynamics of the shelf-break front in this region are poorly understood. Hydrographic data collected by the GLOBEC (Global Ocean Ecosystem Dynamics, a joint research project of the National Science Foundation and the National Oceanographic and Atmospheric Administration) study indicate that a front may lie at the bottom, at the surface, at both, at neither, or extend throughout the water column as one large front. Along the continental slope, in the northeastern gulf, flow consists of the broad, diffuse Alaska Current, which becomes transformed into the narrow, rapid Alaska Stream in the northern gulf.

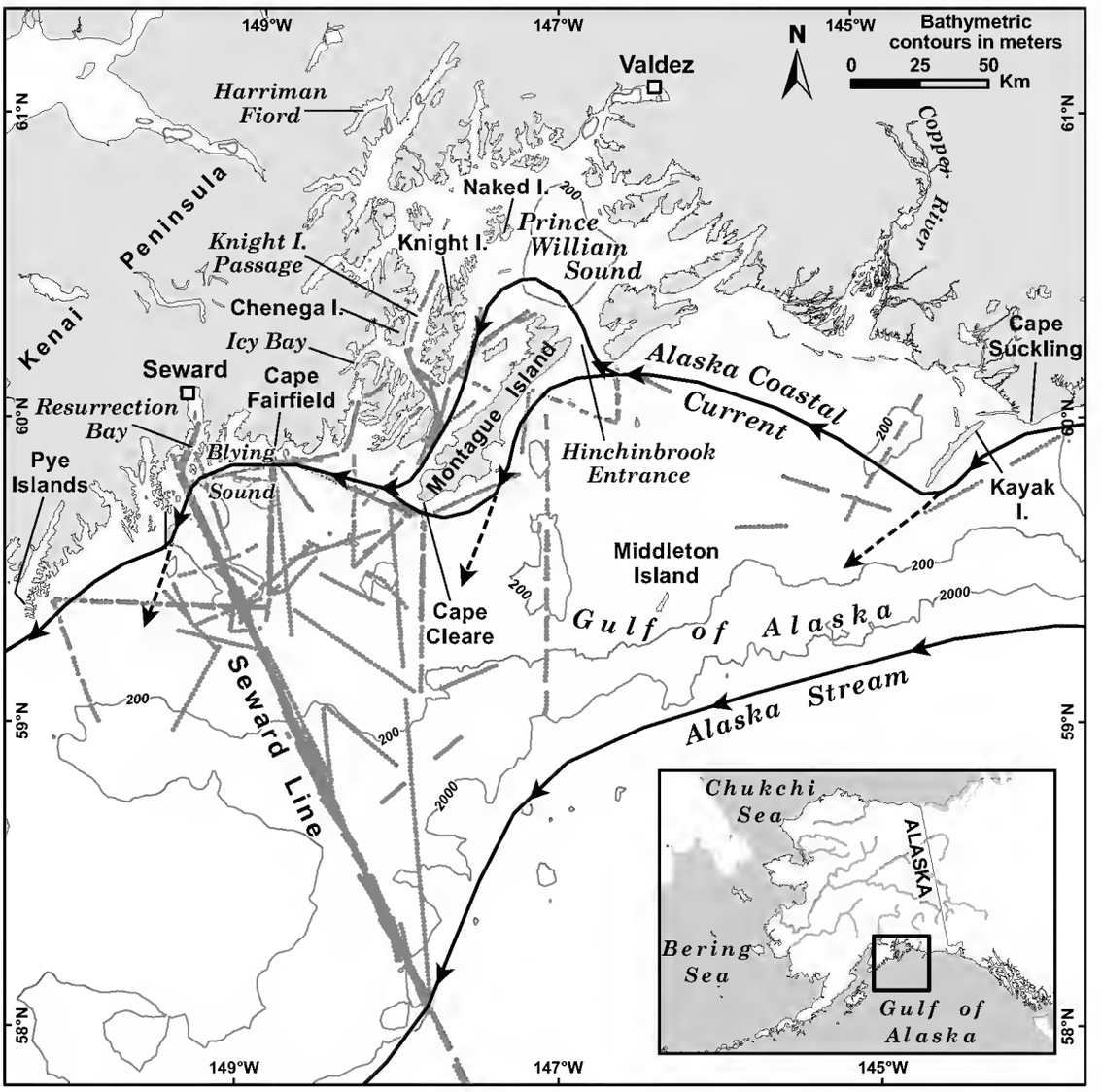

Figure 1. Study area in the northern Gulf of Alaska showing main currents (black lines) and locations sampled during shipboard surveys (gray lines), October–May 1997–2001.

METHODS

Data Collection

I recorded the distribution and abundance of seabirds during 16 oceanographic cruises in the northern Gulf of Alaska and adjacent waters from October 1997 through March 2001. During this period, there was no cruise in December 1997, and I was unable to participate in the October 1998 and 2000 cruises; Randall Mullen replaced me on the latter. Hence this study is based on three October, three December, four March, three April, and three May cruises.

I recorded seabirds on time and space scales similar to those sampled by the Gulf of Alaska GLOBEC Program. The Seward Line, which was sampled on every cruise, extended across the shelf to the Alaska Stream, including Alaska Coastal Current water, mid-shelf water, the shelf break, and oceanic water in the Alaska Stream. The ship's speed averaged ~18.5 km/h. I recorded sea-

surface temperatures and sea-surface salinities for as many transect samples as possible with an automatic system aboard the ship; however, this system broke down on a few cruises. I rounded temperatures to the nearest 0.1° C and salinities to the nearest 0.1 psu (practical salinity unit).

Following the methods of Tasker et al. (1984) and Gould and Forsell (1989), I recorded my observations as strip transects, in essence, in a zone 300 m off one side of the ship (i.e., from directly forward to 90° starboard) while it moved forward in a straight line at a known and fixed speed. Flying seabirds were recorded according to the "snapshot method" to avoid inflation of density estimates caused by the movement of flying birds through the transect (Tasker et al. 1984, Gould et al. 1989), whereas birds on the water were recorded continuously because they often were difficult to locate with one visual scan and because they were not moving through the transect. Although some authors (e.g., Becker et al. 1997) have argued for the use of line transects in sampling birds at sea, line-transect data are so cumbersome to record in locations with even moderate numbers of birds that the resulting data are of questionable accuracy.

Transects almost always were 5 minutes long, although a few were 4 minutes long if we were stopping at an oceanographic station. Within transects, I recorded data by the minute, allowing calculation of exact location and allowing clumping of data for analyses.

Data Analysis

I pooled all data from the 16 cruises to enumerate the total numbers of each species of seabird seen altogether. For each species and species group, I calculated the percentage of the total number seen. For species richness (Magurran 1988), I counted the number of species seen during each cruise, both for the Seward Line (sampled every cruise) and for all transects on a cruise (the number and location of transects varied somewhat from cruise to cruise, although some areas were sampled on most or all cruises). I then plotted these numbers and interpreted the resulting patterns visually.

I pooled transects into 10-minute intervals when possible because of clumping at different scales (Day and Prichard, unpubl. data). For all cruises combined, the total number of adjusted (5- or 10-minute) transects available for analysis was 2437. For each transect, I divided the total count of birds by the total area sampled to generate a standardized estimate of density (birds/km^2). For each species, I calculated mean density ± 1 standard error (SE) by month and year.

RESULTS

The Environment

Sea-surface temperatures along the Seward Line during my cruises varied seasonally and from year to year. They were highest in October (10.1 ± SE <0.1° C), decreased in December (7.4 ± <0.1° C), were at a minimum in March (5.5 ± <0.1°C) and April (5.6 ± <0.1°C), and increased slowly in May (6.9 ± <0.1°C; Figure 2). The winter of 1997–1998, immediately after the large El Niño of 1997, was the warmest year (mean 7.8 ± 0.1° C), followed closely by 1999–2000 and 2000–2001 (7.6 ± 0.1°C for both); only the winter

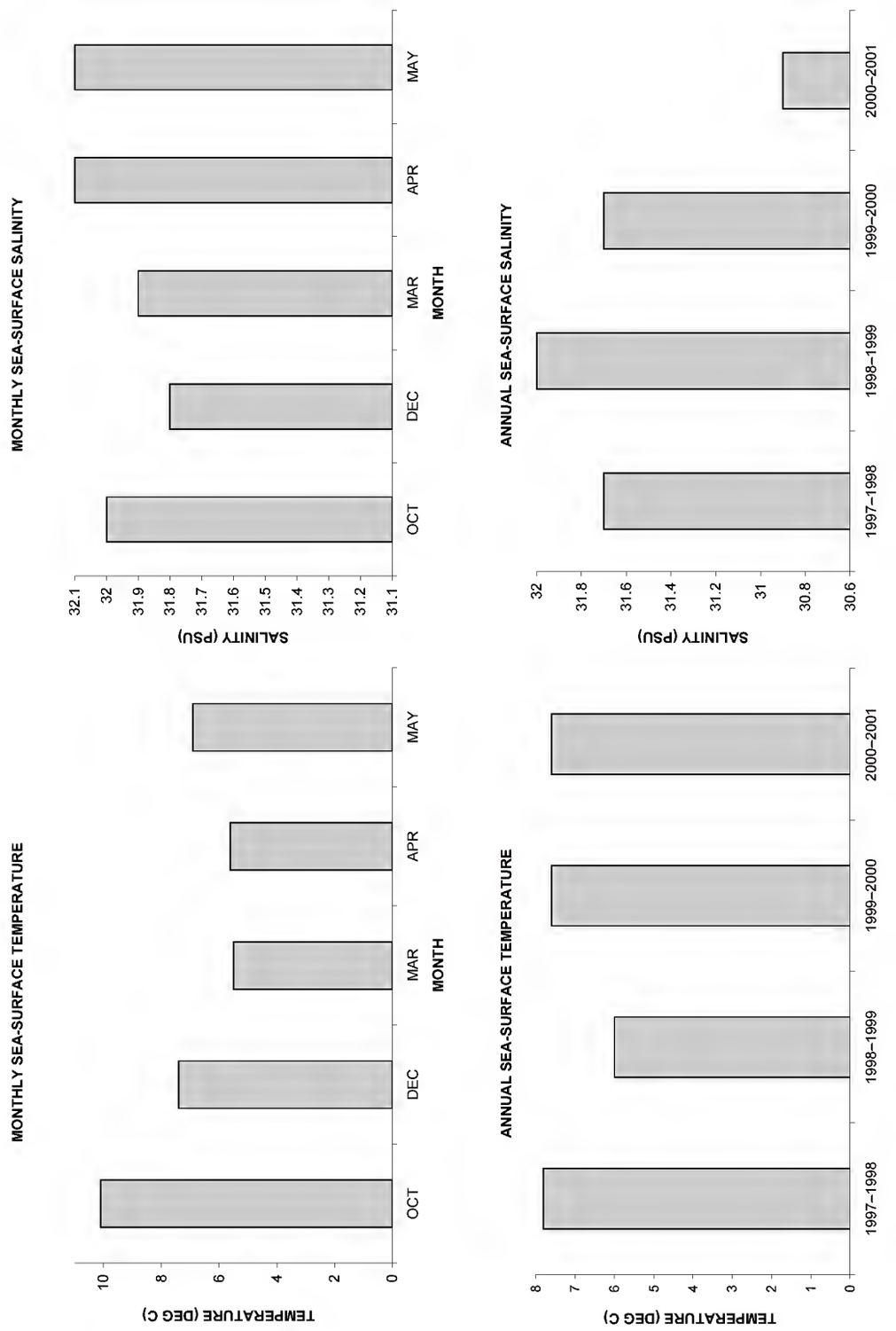

Figure 2. Mean sea-surface temperatures (° C) and sea-surface salinities (practical salinity units) recorded during shipboard surveys in the northern Gulf of Alaska, October–May 1997–2001, by month (top row) and year (bottom row). Standard errors are not shown because they all are very small.

of 1998–1999 was cold (6.0 ± <0.1° C; Figure 2). I believe, however, that the temperature estimate for 2000–2001 was inflated because I had a large sample from the warm fall (the warmest since El Niño of 1997) but did not sample during the other cold months that winter (April, May). Hence I suspect that the mean temperature for 2000–2001 would have been between those for 1998–1999 and 1997–1998.

Sea-surface salinities along the Seward Line also varied seasonally and from year to year, being lowest in the winter of 2000–2001 (mean 30.9 ± 0.1 psu), intermediate in 1997–1998 and 1999–2000 (31.7 ± <0.1 psu for both), and highest in 1998–1999 (32.0 ± <0.1 psu; Fig. 2). Again, however, my sample for 2000–2001 was incomplete. In general, salinities were lowest in December, after the massive input of precipitation as rain in the fall, and highest in April and May, when most precipitation ended up trapped as snow in the mountains.

Seabirds

During the 16 cruises, I recorded 15,896 seabirds of at least 58 species on transects, plus another species not seen on transects (Tables 1–5). These 58 species represented five orders and nine families: Anseriformes (Anatidae), Gaviiformes (Gaviidae), Procellariiformes (Diomedeidae, Procellariidae, and Hydrobatidae), Pelecaniformes (Phalacrocoracidae), and Charadriiformes (Scolopacidae [i.e., phalaropes], Laridae, and Alcidae).

The avifauna was dominated numerically by tubenoses, which collectively represented 50% of all birds (Figure 3); that group was dominated by petrels and shearwaters (31.0% of all birds) and storm-petrels (16.4%), with much smaller numbers of albatrosses (2.9%). Alcids were second in abundance (29%), whereas larids (3%), phalaropes (3%), waterfowl (2%), cormorants (1%), and loons (<1%) occurred in much smaller numbers.

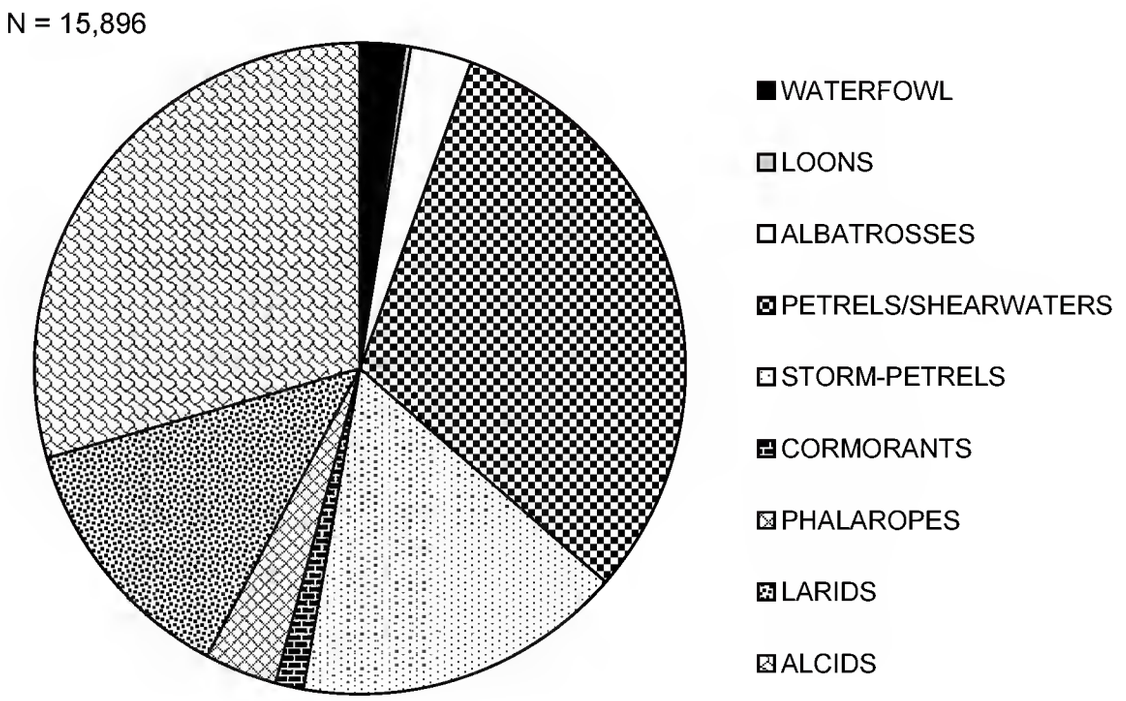

Figure 3. Percent composition of the avifauna of the northern Gulf of Alaska, October–May 1997–2001, by family.

Table 1 Density of Seabirds in the Northern Gulf of Alaska, October 1997–2000

	Year					
	1997		1999		2000	
	Mean[a]	SE[b]	Mean	SE	Mean	SE
Number of transects	143		147		215	
All species pooled	8.36	1.59	5.37	0.40	5.93	0.97
Mallard	0	0	0	0	0.10	0.10
Northern Shoveler	0	0	0.02	0.02	0	0
Greater Scaup	0.07	0.07	0	0	0	0
Harlequin Duck	0.01	0.01	0	0	0	0
Surf Scoter	0	0	0	0	0.05	0.04
White-winged Scoter	0.19	0.19	0.11	0.11	0.02	0.02
Common Goldeneye	0	0	0	0	0.49	0.41
Pacific Loon	0	0	0.03	0.03	0	0
Common Loon	0	0	0	0	0.01	0.01
Laysan Albatross	0.04	0.02	0.13	0.03	0	0
Black-footed Albatross	0.10	0.03	0.30	0.05	0.26	0.04
Northern Fulmar	1.32	0.14	1.79	0.19	1.08	0.10
Mottled Petrel	0	0	0.10	0.04	0	0
Buller's Shearwater	0.03	0.01	0	0	0	0
Sooty Shearwater	3.07	1.53	1.13	0.29	1.01	0.24
Short-tailed Shearwater	0.01	0.01	0.06	0.02	0.04	0.02
Little Shearwater	0.01	0.01	0	0	0	0
Fork-tailed Storm-Petrel	1.37	0.48	0.71	0.14	0.12	0.03
Double-crested Cormorant	0	0	0	0	0.81	0.80
Red-faced Cormorant	0	0	0	0	<0.01	0.01
Pelagic Cormorant	0.02	0.02	0	0	0.04	0.03
Red Phalarope	0	0	0	0	0.01	0.01
Pomarine Jaeger	0.08	0.03	0.05	0.02	0.05	0.02
Parasitic Jaeger	0.02	0.01	0.01	0.01	0.01	0.01
Bonaparte's Gull	0	0	0	0	0.03	0.01
Mew Gull	0.01	0.01	0.02	0.01	0.06	0.03
Herring Gull	0.04	0.02	0.05	0.02	0.41	0.06
Glaucous-winged Gull	0.25	0.05	0.11	0.03	0.52	0.06
Glaucous Gull	0	0	0	0	<0.01	<0.01
Black-legged Kittiwake	0.51	0.09	0.23	0.05	0.73	0.10
Common Murre	0.86	0.17	0.19	0.07	0.06	0.02
Marbled Murrelet	0	0	0	0	0.01	0.01
Kittlitz's Murrelet	0.02	0.02	0.01	0.01	0	0
Ancient Murrelet	0.02	0.02	0	0	0	0
Cassin's Auklet	0.07	0.04	0.01	0.01	0	0
Parakeet Auklet	0	0	0.10	0.04	0	0
Rhinoceros Auklet	0.02	0.01	0.01	0.01	0	0
Horned Puffin	0.04	0.03	0	0	0	0
Tufted Puffin	0.18	0.05	0.17	0.09	0.01	0.01

[a]Birds per square kilometer.

[b]SE, standard error.

Table 2 Density of Seabirds in the Northern Gulf of Alaska, December 1998–2000

	Year					
	1998		1999		2000	
	Mean[a]	SE[b]	Mean	SE	Mean	SE
Number of transects	137		133		151	
All species pooled	6.06	0.57	4.46	0.63	4.96	1.19
Harlequin Duck	0	0	0	0	0.01	0.01
White-winged Scoter	0	0	0	0	0.01	0.01
Black Scoter	0	0	0.01	0.01	0	0
Long-tailed Duck	0	0	0	0	0.01	0.01
Common Merganser	0	0	0	0	0.01	0.01
Red-throated Loon	0.01	0.01	0	0	0	0
Common Loon	0	0	0.01	0.01	0	0
Laysan Albatross	0.14	0.04	0.15	0.06	0.04	0.02
Black-footed Albatross	0.14	0.04	0.07	0.03	0.02	0.01
Short-tailed Albatross	0.01	0.01	0	0	0	0
Northern Fulmar	1.78	0.19	1.93	0.53	0.67	0.10
Sooty Shearwater	0.02	0.02	0	0	1.42	1.02
Short-tailed Shearwater	0.24	0.05	0.01	0.01	0.03	0.02
Fork-tailed Storm-Petrel	0.05	0.02	0.02	0.02	0.03	0.02
Pelagic Cormorant	0.01	0.01	0	0	0.02	0.01
Mew Gull	0.01	0.01	0.07	0.03	0.13	0.09
Herring Gull	0.01	0.01	0.03	0.02	0.05	0.02
Thayer's Gull	0	0	0	0	0.01	0.01
Glaucous-winged Gull	0.16	0.03	0.17	0.05	0.19	0.04
Black-legged Kittiwake	0.44	0.07	0.30	0.10	0.44	0.08
Common Murre	2.95	0.54	1.44	0.27	1.76	0.38
Thick-billed Murre	0.01	0.01	0.01	0.01	0	0
Marbled Murrelet	0.01	0.01	0.07	0.04	0.01	0.01
Kittlitz's Murrelet	0.04	0.02	0.15	0.06	0.06	0.04
Cassin's Auklet	0	0	0.02	0.02	0	0
Crested Auklet	0.01	0.01	0.01	0.01	0	0
Horned Puffin	0	0	0	0	0.02	0.01
Tufted Puffin	0.02	0.01	0	0	0	0

[a]Birds per square kilometer.

[b]SE, standard error.

Five species each composed ≥5.0% of the total avifauna and collectively composed ~74% of all birds recorded across all cruises: the Common Murre (21.3%), Northern Fulmar (18.5%), Fork-tailed Storm-Petrel (16.3%), Sooty Shearwater (10.7%), and Black-legged Kittiwake (7.0%). Another nine species each composed 1.0–4.9% of the total avifauna and collectively composed ~19% of all birds: the Tufted Puffin (3.9%), Glaucous-winged Gull (3.6%), Red Phalarope (3.1%), Black-footed Albatross (1.9%), Short-tailed Shearwater (1.6%), Kittlitz's Murrelet (1.4%), Marbled Murrelet (1.3%), Double-crested Cormorant (1.1%), and Laysan Albatross (1.0%). Finally, the other 44 of the 58 total species each composed <1% and collectively composed ~7% of the total avifauna.

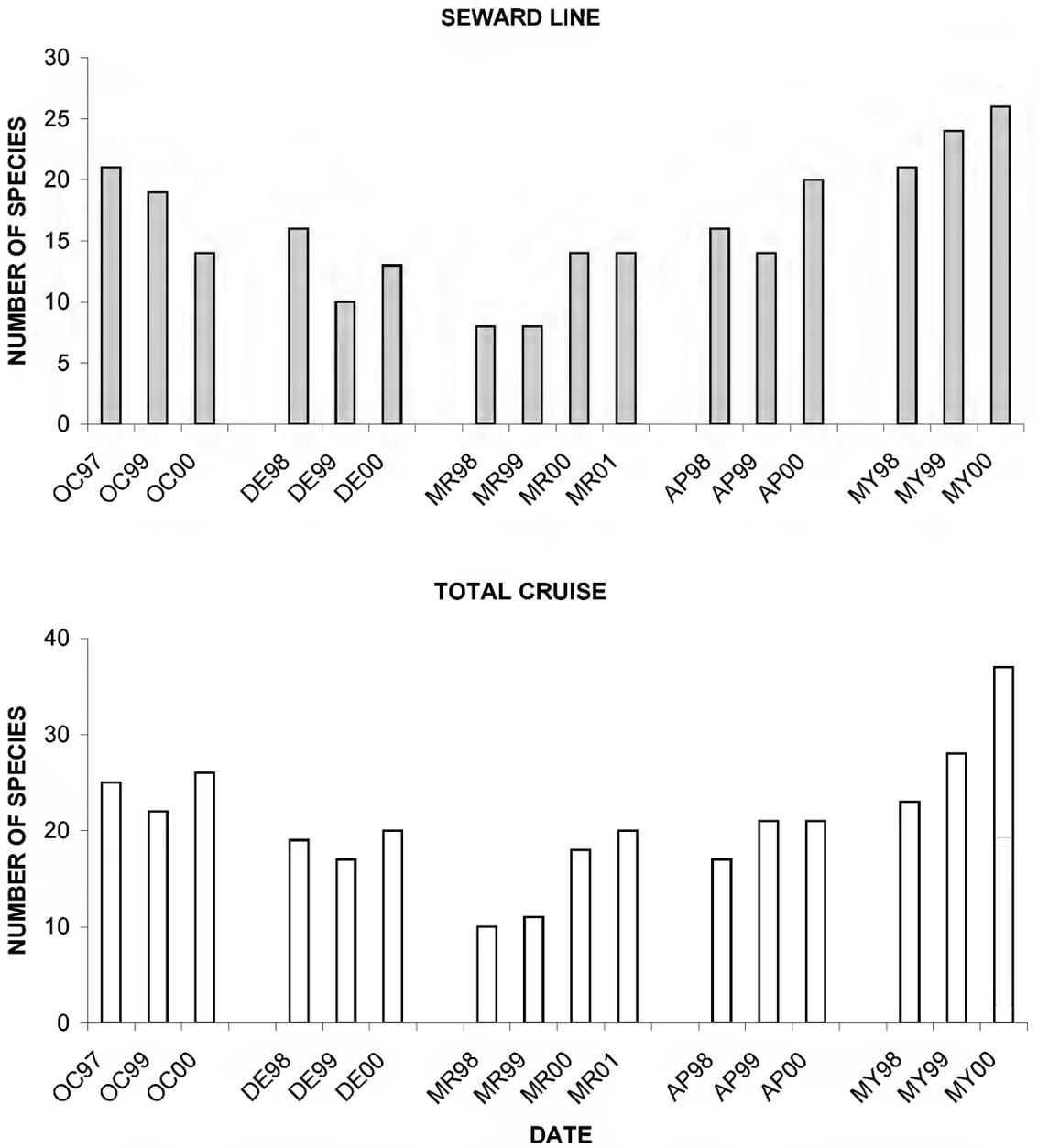

Figure 4. Mean species richness of the wintering avifauna of the northern Gulf of Alaska, October–May 1997–2001, along the Seward Line (top; see location on Figure 1) and across the study area as a whole (bottom).

Species richness and overall densities. Along the Seward Line, I noted between 8 and 26 species per cruise, with an overall mean of 16.1 species (Figure 4). The number decreased seasonally from October (mean 18.0 species per cruise) to December (mean 13.0) and March (mean 11.0), then increased rapidly in April (mean 16.7) and May (mean 23.7), when wintering species are leaving, breeding species are arriving, and migrants are present. Each cruise taken in its entirety, the number varied between 10 and 37 species per cruise, with an overall mean of 20.9 (Figure 4). As seen along the Seward Line, the number for entire cruises decreased seasonally from October (mean 24.3 species per cruise) to December (mean 18.7) and March (mean 14.8), then increased rapidly in April (mean 19.7) and May (mean 29.3).

Table 3 Density of Seabirds in the Northern Gulf of Alaska, March 1998–2000

	Year							
	1998		1999		2000		2001	
	Mean[a]	SE[b]	Mean	SE	Mean	SE	Mean	SE
Number of transects	128		140		143		148	
All species pooled	4.77	0.51	3.90	0.43	5.98	0.67	6.18	0.95
Harlequin Duck	0	0	0	0	0.03	0.03	0.01	0.01
Surf Scoter	0	0	0	0	0.02	0.02	0	0
White-winged Scoter	0	0	0	0	0	0	0.01	0.01
Pacific Loon	0	0	0	0	0	0	0.01	0.01
Laysan Albatross	0	0	0.02	0.01	0.06	0.02	0.12	0.05
Black-footed Albatross	0.03	0.02	0.03	0.02	0.03	0.02	0.07	0.04
Northern Fulmar	1.40	0.28	1.53	0.25	1.17	0.20	1.22	0.19
Short-tailed Shearwater	0	0	0.01	0.01	0.01	0.01	0	0
Fork-tailed Storm-Petrel	0.15	0.08	0.12	0.04	0.06	0.02	0.09	0.03
Double-crested Cormorant	0	0	0	0	0	0	0.01	0.01
Pelagic Cormorant	0.02	0.02	0.02	0.02	0.03	0.02	0	0
Mew Gull	0	0	0	0	0.03	0.01	0.18	0.11
Herring Gull	0	0	0	0	0.01	0.01	0.01	0.01
Glaucous-winged Gull	0.18	0.04	0.15	0.04	0.16	0.06	0.24	0.05
Black-legged Kittiwake	0.52	0.08	0.37	0.07	0.64	0.10	0.82	0.16
Common Murre	2.13	0.37	1.38	0.31	3.35	0.62	2.65	0.80
Thick-billed Murre	0.05	0.02	0	0	0.01	0.01	0.01	0.01
Unidentified murre	0.01	0.01	0	0	0	0	0	0
Pigeon Guillemot	0.05	0.03	0	0	0	0	0	0
Marbled Murrelet	0	0	0.02	0.02	0.06	0.03	0.33	0.14
Kittlitz's Murrelet	0.24	0.07	0.27	0.12	0.10	0.04	0.22	0.09
Cassin's Auklet	0	0	0	0	0.09	0.06	0.03	0.03
Parakeet Auklet	0	0	0	0	0	0	0.01	0.01
Crested Auklet	0	0	0	0	0	0	0.02	0.02
Tufted Puffin	0	0	0	0	0.14	0.06	0.12	0.06

[a]Birds per square kilometer.

[b]SE, standard error.

Total densities of all species combined followed a seasonal pattern similar to that for species richness, in that overall densities decreased from October (6.4 birds/km^2) to December and March (mean 5.2 birds/km^2 in both months), then increased from March to April (mean 7.6 birds/km^2; Figure 5). Total densities peaked in May with a mean of 12.9 birds/km^2.

Species Accounts

In these accounts, I discuss the abundance of most species in general terms and discuss details of habitat use and seasonal, annual, and/or geographic variation in abundance for the more common species; data on seasonal abundance of all species are presented in Tables 1–5. This difference in detail is necessary because 44 of the 58 species of birds seen on transects were recorded only in small numbers (i.e., each was <1% of the total number

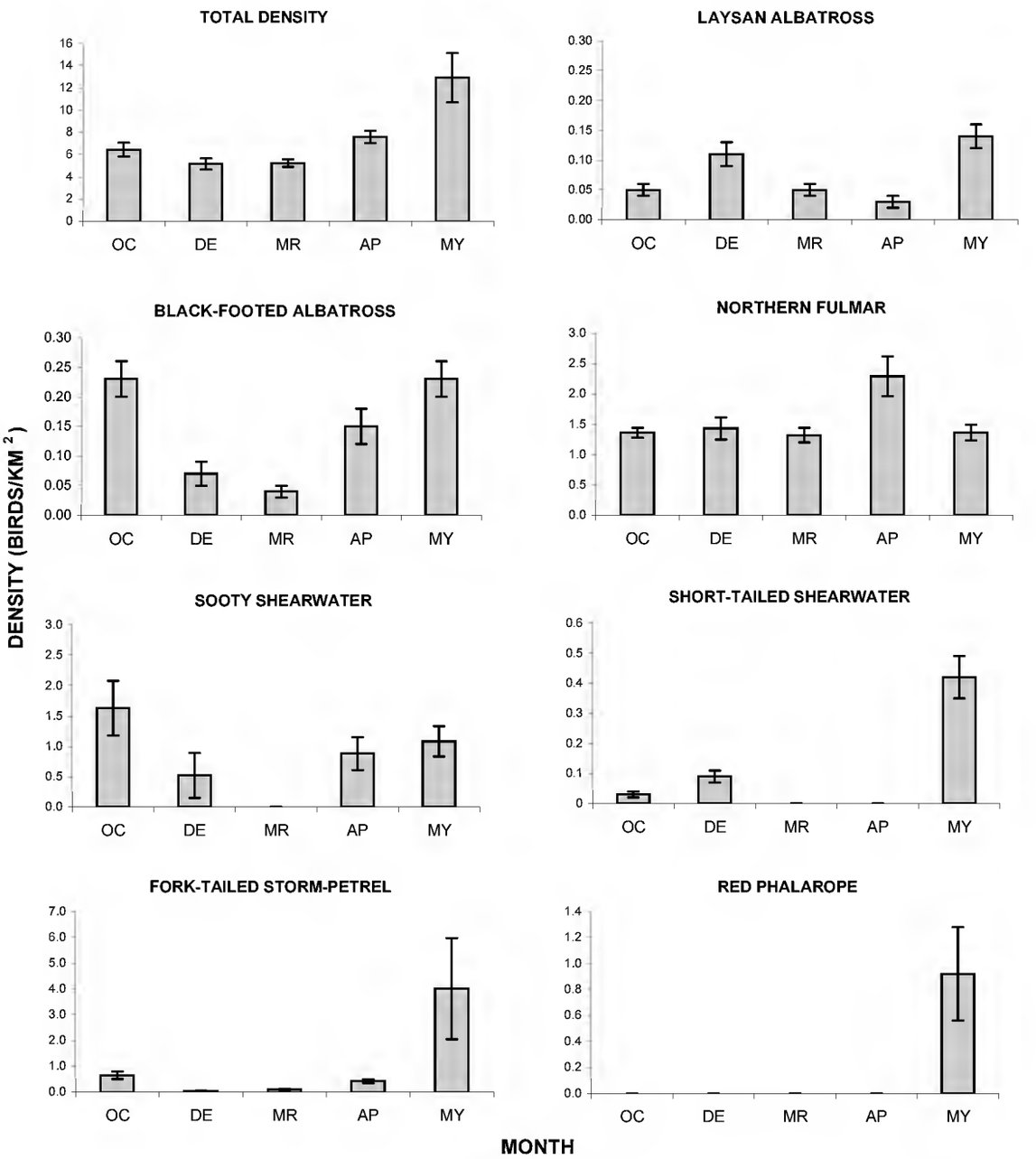

Figure 5. Mean (± 1 standard error) densities (birds/km^2) of all birds combined and 7 of the 13 most abundant seabird species in the northern Gulf of Alaska, October–May 1997–2001, by month.

seen). In addition to the 58 species recorded on transects, I saw one species, the Black-headed Gull (*Larus ridibundus*) only off transects. The account specifies the fraction the species constituted of the total count if the fraction is greater than 0.2%; if it is less, this figure is omitted.

I follow Kessel and Gibson (1978) in classifying each species in terms of abundance (abundant, common, fairly common, uncommon, rare, casual, and accidental) during three periods: fall migration (October), winter (December–March, sometimes April), and spring migration (April–May). "Casual" implies not annual, and "accidental" implies that the species is so far from its normal range that further records are unlikely.

Cackling/Canada Goose *Branta hutchinsii/canadensis* (rare fall and spring): On

Table 4 Density of Seabirds in the Northern Gulf of Alaska, April 1998–2000

	Year					
	1998		1999		2000	
	Mean[a]	SE[b]	Mean	SE	Mean	SE
Number of transects	133		161		104	
All species pooled	10.11	1.04	4.74	0.74	8.79	1.09
Green-winged Teal	0	0	0.09	0.09	0	0
White-winged Scoter	0	0	0.01	0.01	0	0
Black Scoter	0	0	0.01	0.01	0	0
Pacific Loon	0	0	0.02	0.01	0.02	0.02
Yellow-billed Loon	0	0	0.01	0.01	0	0
Laysan Albatross	0.03	0.02	0.02	0.02	0.04	0.02
Black-footed Albatross	0.10	0.04	0.06	0.03	0.35	0.11
Short-tailed Albatross	0	0	0.01	0.01	0	0
Northern Fulmar	4.06	0.91	0.84	0.17	2.28	0.30
Mottled Petrel	0.01	0.01	0	0	0.09	0.04
Sooty Shearwater	0.05	0.04	0.61	0.24	2.35	0.96
Short-tailed Shearwater	0	0	0	0	0.01	0.01
Fork-tailed Storm-Petrel	0.21	0.07	0.21	0.09	1.02	0.18
Red-faced Cormorant	0.09	0.06	0	0	0.01	0.01
Pelagic Cormorant	0.14	0.09	0.05	0.04	0	0
Pomarine Jaeger	0	0	0	0	0.01	0.01
Mew Gull	0.03	0.03	0.02	0.01	0	0
Herring Gull	0.02	0.01	0	0	0.04	0.03
Glaucous-winged Gull	0.49	0.10	0.48	0.14	0.07	0.03
Glaucous Gull	0	0	0	0	0.01	0.01
Black-legged Kittiwake	0.59	0.10	0.82	0.33	0.56	0.11
Common Murre	3.92	0.51	1.28	0.19	1.45	0.30
Thick-billed Murre	0.02	0.01	0	0	0.02	0.02
Marbled Murrelet	0	0	0.02	0.02	0.11	0.07
Kittlitz's Murrelet	0.31	0.08	0.08	0.04	0.18	0.08
Cassin's Auklet	0.01	0.01	0.01	0.01	0.01	0.01
Rhinoceros Auklet	0.02	0.02	0.07	0.04	0.04	0.03
Tufted Puffin	0	0	0.01	0.01	0.09	0.04

[a]Birds per square kilometer.

[b]SE, standard error.

transects, a flock of four flying north in the mid-shelf area, ~35 km offshore, on 6 May 1999. Off transects, a flock of 40 sitting on the ocean ~9 km south of Cape Fairfield on 10 October 1999, three flying off outer Montague Island on 17 April 1999, and a flock of 18 flying in the mid-shelf area, ~35 km offshore, on 7 May 1998. Both species cross the Gulf of Alaska during migration, and I noted some of these as "small geese," suggesting that they were Cackling Geese.

Brant *Branta bernicla* (rare–uncommon spring): On transects, a flock of four flying north (presumably coming in from the deep North Pacific) near the shelf break on 6 May 1999 and four flying east (not west) off the mouth of Resurrection Bay on 17 May 2000. Off transects, a flock of six sitting on the ocean, one bird flying northwest, and ~20 flying west–northwest, all over the outer part of the mid-shelf on 8 May

Table 5 Density of Seabirds in the Northern Gulf of Alaska, May 1998–2000

	Year					
	1998		1999		2000	
	Mean[a]	SE[b]	Mean	SE	Mean	SE
Number of transects	128		173		253	
All species pooled	11.17	0.89	6.38	0.53	18.28	4.81
Cackling/Canada Goose	0	0	0.06	0.06	0	0
Brant	0	0	0.02	0.02	0.03	0.03
Northern Shoveler	0	0	0	0	0.02	0.02
Green-winged Teal	0	0	0.01	0.01	0	0
Greater Scaup	0	0	0.11	0.11	0	0
Common Eider	0.22	0.22	0	0	0	0
Long-tailed Duck	0	0	0.04	0.04	0.24	0.18
Red-throated Loon	0	0	0.04	0.02	0	0
Pacific Loon	0.14	0.12	0.10	0.03	0.01	0.01
Yellow-billed Loon	0.01	0.01	0	0	0.01	0.01
Laysan Albatross	0.25	0.05	0.06	0.02	0.14	0.03
Black-footed Albatross	0.18	0.06	0.30	0.07	0.20	0.04
Northern Fulmar	2.40	0.35	0.93	0.11	1.12	0.21
Sooty Shearwater	0.34	0.08	0.77	0.35	1.66	0.49
Short-tailed Shearwater	0.62	0.12	0.28	0.10	0.41	0.11
Fork-tailed Storm-Petrel	1.38	0.26	0.65	0.15	7.64	4.28
Leach's Storm-Petrel	0	0	0	0	0.09	0.04
Double-crested Cormorant	0	0	0	0	<0.01	<0.01
Red-faced Cormorant	0	0	0	0	0.01	0.01
Pelagic Cormorant	0.02	0.01	0	0	0.02	0.02
Red-necked Phalarope	0	0	0	0	0.31	0.11
Red Phalarope	0.04	0.04	0	0	2.00	0.79
Pomarine Jaeger	0	0	0.05	0.02	0.10	0.03
Parasitic Jaeger	0	0	0	0	<0.01	<0.01
Long-tailed Jaeger	0	0	0.01	0.01	0.04	0.02
Bonaparte's Gull	0	0	0	0	0.02	0.01
Mew Gull	0	0	0.01	0.01	<0.01	<0.01
Herring Gull	0.02	0.02	0.04	0.02	0.04	0.01
Glaucous-winged Gull	0.27	0.07	0.38	0.08	0.35	0.08
Glaucous Gull	0	0	0.02	0.01	0	0
Sabine's Gull	0	0	0	0	0.05	0.02
Black-legged Kittiwake	0.25	0.06	0.40	0.11	0.64	0.12
Arctic Tern	<0.01	0.02	0.24	0.08	0.17	0.10
Common Murre	2.76	0.69	0.64	0.15	0.93	0.32
Thick-billed Murre	0	0	0	0	0.01	0.01
Pigeon Guillemot	0.02	0.01	0	0	0	0
Marbled Murrelet	0.17	0.07	0.11	0.04	0.43	0.08
Kittlitz's Murrelet	0.19	0.07	0.02	0.01	0.07	0.02
Ancient Murrelet	0.16	0.16	0.04	0.02	0.16	0.05
Cassin's Auklet	0.01	0.01	0.04	0.02	0.04	0.02
Parakeet Auklet	0	0	0	0	0.02	0.01
Rhinoceros Auklet	0.03	0.02	0.01	0.01	<0.01	<0.01
Horned Puffin	0	0	0	0	0.28	0.08
Tufted Puffin	1.67	0.30	0.99	0.12	1.00	0.12

[a]Birds per square kilometer.

[b]SE, standard error.

1999. Thus, in spring, the species appears to migrate through the region primarily far offshore (see also Gabrielson and Lincoln 1959).

Mallard *Anas platyrhynchos* (rare fall): On transects, a flock of 21 flying southeast over the mid-shelf on 4 October 2000. The lack of other records probably reflects the species' primary wintering habitat in protected waters and on shorelines (Forsell and Gould 1981, Day et al. 1997b).

Northern Shoveler *Anas clypeata* (rare–uncommon fall and spring): On transects, a flock of three flying east ~20 km offshore on 7 October 1999 and a flock of four flying west ~110 km offshore on 17 May 2000. Off transects, three flying east ~150 km offshore on 7 October 1999, two flying northwest ~260 km offshore and clearly migrating over the deep North Pacific on 7 May 1999, and a flock of 17 sitting on the ocean ~165 km offshore on 8 May 1999.

Green-winged Teal *Anas crecca* (rare spring): On transects, a flock of seven sitting on the ocean 5–10 km south of Montague Island on 17 April 1999 and one flying north (presumably coming inshore from the deep North Pacific) over the mid-shelf on 12 May 1999.

Greater Scaup *Aythya marila* (rare fall, uncommon spring): On transects, a flock of nine flying east on 13 October 1997 and a flock of 17 sitting on the ocean on 8 May 1999, both ~160 km offshore near the shelf break. Off transects, 20 birds ~37 km offshore and 5 birds ~160 km offshore, near the shelf break, both on 6 May 1999, and 1 pair flying inshore (north) from the deep North Pacific ~200 km offshore on 18 May 2000.

Common Eider *Somateria mollissima* (rare spring): On transects, a flock of 26 flying southwest over the mid-shelf on 7 May 1998. The Common Eider is a rare visitor to the region, being more common in winter and primarily along the open coast (Isleib and Kessel 1973).

Harlequin Duck *Histrionicus histrionicus* (rare fall–spring): Total six during transects, scattered between October and March. All except two were in the Alaska Coastal Current; the two exceptions were in inner part of the mid-shelf.

Surf Scoter *Melanitta perspicillata* (rare fall–spring): On transects, a pair in western Prince William Sound on 5 October 2000, five just south of Cape Fairfield on 10 October 2000, and a pair in southern Prince William Sound on 11 March 2000. Off transects, scattered birds were in Prince William Sound March–May.

White-winged Scoter *Melanitta fusca* (uncommon fall, rare winter and spring): Total of 52 in 7 groups during transects, representing 0.3% of all birds seen on transects. Most common in October, when recorded every year, but occurred sparingly December–April. Occurred widely from Prince William Sound to ~185 km offshore, with latter group (15 birds) seen migrating over the deep North Pacific on 6 October 1999. Off transects, scattered birds in Prince William Sound October–April of most years and seven flying northwest ~45 km offshore on 20 May 2000.

Black Scoter *Melanitta nigra* (rare winter and spring): Single birds flying west of Kayak Island on 5 December 1999 and ~55 km offshore, in the mid-shelf, on 16 April 1999.

Long-tailed Duck *Clangula hyemalis* (rare winter, uncommon spring): On transects, total 70 birds, two in December and the rest in May; represented 0.4% of all birds. Single birds in Blying Sound on 3 and 6 December 2000; flocks of six and two flying west ~18 and ~37 km south of Cape Fairfield on 11 May 1999 and 20 May 2000, respectively; and flocks of 45 and 15 flying east (not west) ~45 km offshore, over the mid-shelf, on 19 May 2000. Off transects, one bird ~150 km offshore, over the shelf break, on 2 December 1999; 25–30 in Icy Bay (Prince William Sound) on 18 April 1999; flock of 16 flying west over the mid-shelf on 8 May 1998; and ~200 birds in 5 groups flying northeast or east (not west) over the mid-shelf on 19 May 2000.

Common Goldeneye *Bucephala clangula* (uncommon fall): Not seen on open water. Flocks of 79 and 17 in Bainbridge Passage (Prince William Sound) on 6 October 2000 represented 0.6% of all birds.

Common Merganser *Mergus merganser* (rare winter): One in Blying Sound on 3 December 2000.

Red-throated Loon *Gavia stellata* (rare winter and spring): Total eight during transects: single bird in lower Resurrection Bay on 1 December 1998 and seven scattered others, mostly migrating west over the inner and mid-shelf, 6–11 May 1999.

Pacific Loon *Gavia pacifica* (uncommon fall–spring): Total 45 during transects, representing 0.3% of all birds: flock of four migrating west ~14 km south of Cape Fairfield on 10 October 1999; two single birds in southern Prince William Sound on 12 March 2001; five single birds migrating west in Blying Sound in April 1999 and 2000; and 34 birds, mostly migrating west, spread across the shelf in May of every year. Off transects, six birds flying west in southern Prince William Sound on 12 March 2001 and two in the western part of the sound on 10 May 1999.

Common Loon *Gavia immer* (rare fall and winter): Single birds ~18 km south of Cape Fairfield on 6 October 2000 and east of Kayak Island on 5 December 1999.

Yellow-billed Loon *Gavia adamsii* (rare winter and spring): On transects, four single birds: one in western Prince William Sound on 17 April 1999, one south of Montague Island on 13 May 1998, and two south of the Copper River mouth on 23 May 2000. Off transects, one in central Prince William Sound on 5 December 1998.

Laysan Albatross *Phoebastria immutabilis* (uncommon–fairly common fall–spring): Seen on 14 of 16 cruises and in every month; most common in December and May and least common in March and April (Figure 5). Represented 1.0% of all birds and constituted up to 3.4% of all birds on some cruises. Occurred primarily at the shelf break and in the oceanic water of the Alaska Stream but regular inshore as far as the outer part of the mid-shelf; one even was seen in the Alaska Coastal Current. Although Gould et al. (1982) suggested that the species occurs only from March to November, these data indicate that the species occurs year round.

Black-footed Albatross *Phoebastria nigripes* (common fall and spring, uncommon winter): Seen on every cruise, although least common in December and March (Figure 5); represented 1.9% of all birds (ninth most abundant species), constituting up to 5.7% of all birds on some cruises. Although most occurred at the shelf break and in the Alaska Stream, some ranged regularly as far inshore as the outer part of the mid-shelf (especially during warmer months), and several were seen inshore in the Alaska Coastal Current. Although Isleib and Kessel (1973) and Gould et al. (1982) suggested that the species was irregular from October to May, these data indicate that the species occurs year round.

Short-tailed Albatross *Phoebastria albatrus* (rare winter and spring): Two juveniles during transects, one at 58° 46' N, 148° 27' W on 2 December 1998 and one at 58° 35' N, 148° 14' W on 13 April 1999 (both near the shelf break). Off transects, one adult while the ship was on station at 58° 06' N, 147° 48' W (in the Alaska Stream) on 18 May 2000.

Northern Fulmar *Fulmarus glacialis* (common fall and winter, common–abundant spring): Seen during every cruise, representing 18.5% of all birds seen during transects (second most abundant species) and up to 43.7% of all birds on some cruises. Most abundant in April (Figure 5), suggesting migration through area. Most abundant at the shelf break, least common in the Alaska Coastal Current, and absent from Prince William Sound.

Mottled Petrel *Pterodroma inexpectata* (rare–uncommon fall and spring): Total

of 20 birds on 3 of 16 cruises: 12 at the shelf break and in oceanic water (150–200 km offshore) on 6 and 7 October 1999, one at the shelf break (~150 km offshore) on 4 April 1998, and seven from the mid-shelf to the Alaska Stream (70–200 km offshore) on 18 and 19 April 2000. On the last dates, single birds at 58° 11' N, 148° 47' W and 58° 11' N, 148° 48' W were the farthest inshore I have seen this oceanic species, which concentrates over the deep waters of the Alaska Gyre (Day 1992). The species was previously recorded as late as October but not as early as April (Gould et al 1982).

Buller's Shearwater *Puffinus bulleri* (casual, possibly rare, fall): Four on transects and two off transects, all over the mid-shelf, in October 1997. On 13 October 1997 (during large El Niño that year), single birds were at 58° 47' N, 148° 30' W, 58° 36' N, 148° 16' W, and 58° 35' N, 148° 15' W. On 15 October, one was at 59° 35' N, 148° 53' W, and single birds were off transects at 58° 43' N, 148° 25' W and 59° 27' N, 148° 52' W. The species is a rare summer visitor to oceanic waters of the Gulf of Alaska from April to October (Kessel and Gibson 1978, Gould et al 1982, Isleib and Kessel 1989).

Sooty Shearwater *Puffinus griseus* (common fall and spring, rare winter): Regular in October, April, and May, rarer in December, and never seen in March (Figure 5). Represented 10.7% of all birds (fourth most abundant species) and constituted up to 36.2% of all birds on some cruises. Essentially occurred only in the Gulf of Alaska, with only one seen in Prince William Sound (3 December 2000). Moved onto the shelf and into the Alaska Coastal Current during the warmer months of October and May but occurred farther offshore in April, suggesting inshore–offshore seasonal movement.

Short-tailed Shearwater *Puffinus tenuirostris* (rare fall, rare–uncommon winter, common spring): Seen during 12 of 16 cruises and in all months, although common only during May (Figure 5). Represented 1.6% of all birds (tenth most abundant species) and constituted as much as 6.0.% of all birds on some cruises. Occurred only in the Gulf of Alaska, usually in small groups associated with or near Sooty Shearwaters, and ranged from the Alaska Coastal Current to the Alaska Stream, being most abundant at the shelf break and in the Alaska Stream.

Little Shearwater *Puffinus assimilis* (accidental visitor): One bird at 59° 24' N, 149° 03' W on 12 October 1997, over the mid-shelf, during El Niño of 1997. This very small shearwater was seen closely: underwing nearly completely white, with narrow black border on forward edge of wing and white extending over most of undersides of primaries; axillaries and undertail-coverts also white; unfortunately, I did not notice whether dark cap extended above or below eye (nominate *assimilis* from the southwestern Pacific has white on face to above the eye, whereas *elegans* from near New Zealand has a dark cap extending below eye; Harrison 1985). These characters separate the Little from Audubon's Shearwater, which is slightly larger, has more black on the underwing, and has black in the axillaries. Complete details are on file at the University of Alaska Museum (UAM). The only other records of this species for western North America are a sighting by Jeff B. Allen of one near Kodiak Island, Alaska, on 26 August 1996 (drawing and details at UAM) and of one photographed in Monterey County, California, on 29 October 2003 (San Miguel and McGrath 2005). The only other records for the North Pacific come from Midway in the Leeward Hawaiian Islands, where the species is accidental (AOU 1998); Reginald E. David (in litt.) pulled a calling bird from a burrow there in December 1991.

Fork-tailed Storm-Petrel *Oceanodroma furcata* (uncommon fall, rare winter, abundant spring): Seen on all cruises and in all months, although least abundant from December to April (Figure 5). Represented 16.3% of all birds (third most abundant species) and constituted up to 43.9% of all birds on some cruises. Occurred in both the Gulf of Alaska and Prince William Sound but abandoned nearshore waters nearly

completely in December and March, suggesting inshore–offshore seasonal movement. Densities highest over the mid-shelf and at shelf-break front. Although the species supposedly does not occur inshore until May (Isleib and Kessel 1973, Forsell and Gould 1981, Gould et al. 1982), these data suggest that inshore movement takes place earlier than that.

An enormous feeding flock of Fork-tailed Storm-Petrels was along the mid-shelf part of the Seward Line on 19 and 20 May 2000, concentrated in an area ~18 km north–south and ≥9 km east–west, for a minimal area of ~162 km^2; I suspected that the flock was even larger than this. Associated with this flock were Red and Red-necked phalaropes, the only Leach's Storm-Petrels recorded during surveys, and Humpback Whales (*Megaptera novaeangliae*). At a mean density of ~146 birds/km^2, this flock probably contained >25,000 Fork-tailed Storm-Petrels, plus large numbers of Red Phalaropes and small numbers of Leach's Storm-Petrels and Red-necked Phalaropes.

Leach's Storm-Petrel *Oceanodroma leucorhoa* (casual, probably annual, in spring): Total of 17, all in May 2000: one ~65 km offshore on 19 May 2000 and 16 over the mid-shelf with Fork-tailed Storm-Petrels and phalaropes on 18 May 2000 (see above).

Double-crested Cormorant *Phalacrocorax auritus* (rare–fairly common fall, rare winter and spring): Total 169 birds, although four of five records were of single birds. Represented 1.1% of all birds and constituted up to 15.9% of all birds on some cruises. Single birds were in Blying Sound on 6 October 2000, at the mouth of Resurrection Bay on 8 October 2000, and in western Prince William Sound on 5 March 2001 and 25 May 2000. Largest group was a flock of 165 migrating east at 58° 50' N 148° 32' W (~120 km offshore, just inshore of the shelf break) on 8 October 2000. In contrast to these data, Gould et al. (1982) suggested that this species migrates coastally in the Gulf of Alaska.

Red-faced Cormorant *Phalacrocorax urile* (rare fall and spring): On transects, total of 14 over 4 cruises during the warmer months: one in fall (lower Resurrection Bay, 10 October 2000), the rest in April or May. Off transects, two in Bainbridge Passage (Prince William Sound) on 18 April 1999 and one ~9 km offshore on 9 May 1999. All birds except one in mid-shelf water were in the Alaska Coastal Current. The population appeared to have expanded dramatically in 1960s (Isleib and Kessel 1973); first recorded in the region in 1959, the Red-faced was the most common breeding cormorant in Gulf of Alaska by 1976 (Kessel and Gibson 1978), but in recent years has been greatly outnumbered by the Pelagic (unpubl. data), suggesting a major decline.

Pelagic Cormorant *Phalacrocorax pelagicus* (rare fall and winter, uncommon spring): On transects, total of 51 during 11 cruises and in all months, representing 0.3% of all birds. Noted off transects in both the Gulf of Alaska and Prince William Sound. Least common in December and most common in April and in the gulf. Most frequent in the Alaska Coastal Current, but a few strayed into inner part of the mid-shelf; one bird was ~160 km offshore, at the shelf break, on 2 December 1998.

Red-necked Phalarope *Phalaropus lobatus* (rare spring): Total of 60 in May 2000, representing 0.4% of all birds. Occurred in the Alaska Coastal Current and occasionally mid-shelf water, in the Gulf of Alaska only. Many were seen feeding in surface "slicks" or wrack lines indicating surface convergences and divergences.

Red Phalarope *Phalaropus fulicarius* (rare fall, common spring): Seen only during migration, with one in October and many in May, although not annually (Figure 5). Represented 3.1% of all birds (eighth most abundant species), even though it occurred essentially during May only, and constituted up to 11.4% of all birds seen on some cruises. Occurred from the Alaska Coastal Current to the Alaska Stream but most common over the mid-shelf.

Pomarine Jaeger *Stercorarius pomarinus* (rare fall and spring): On transects, total of 52, representing 0.3% of all birds. Noted every October, once in April, and on two of three May cruises. Equally common in October and May. An early migrant was at 58° 17' N, 147° 58' W, over the Alaska Stream, on 19 April 2000; otherwise, all birds occurred over the mid-shelf and, less commonly, the Alaska Coastal Current. Off transects, one near Cape Fairfield on 11 May 1999.

Parasitic Jaeger *Stercorarius parasiticus* (rare fall and spring): On transects, total six birds. Seen every fall but only twice in spring (one ~35 km south of Cape Fairfield on 20 May 2000; one off transects south of Montague Island on 17 April 1999). Occurred only in the Gulf of Alaska and in mid-shelf water.

Long-tailed Jaeger *Stercorarius longicaudus* (rare spring): Total 12 birds, all during May (1 in 1999 and 11 in 2000). Most were migrating west over the Gulf of Alaska. Four were over the Alaska Coastal Current, and eight were over mid-shelf water up to ~55 km offshore.

Black-headed Gull *Larus ridibundus* (casual winter): One off transects, a basic-plumaged bird visiting the ship while it was on station at 59° 25' N, 149° 04' W on 3 March 2001. Observed closely, it was substantially larger than a Bonaparte's Gull and its primaries had a dark underside. The only other record for the Gulf of Alaska is of one bird in late summer–fall 1977 (Isleib and Kessel 1989). This is the only winter record of the Black-headed Gull in Alaska.

Bonaparte's Gull *Larus philadelphia* (rare fall and spring): Total ten birds, five each in October 2000 and May 2000. Occurred in both Prince William Sound and the Gulf of Alaska, primarily in the Alaska Coastal Current, with a few seen over mid-shelf water up to ~45 km offshore. In the Gulf of Alaska, the species is a coastal migrant, rarely seen offshore (Gould et al. 1982).

Mew Gull *Larus canus* (rare–uncommon winter fall–spring): Total 79 birds, representing 0.5% of all birds. Occurred every month but considerably more common October–March, becoming much rarer in April and May, when moving to coastal and inland sites to breed. All records except three were for the Alaska Coastal Current; the exceptions were two individuals over the mid-shelf and one ~150 km offshore, at the shelf break.

Herring Gull *Larus argentatus* (rare–uncommon fall and winter, rare spring): On transects, total of 114 on 13 of 16 cruises, representing 0.7% of all birds. Although seen every month, most common in October and December and least common in March and April, increasing in abundance again in May. Decreased in abundance from the Alaska Coastal Current to oceanic waters (to ~220 km offshore). Off transects, birds seen from October to May and in both the Gulf of Alaska and Prince William Sound.

Thayer's Gull *Larus thayeri* (casual winter): On transects, two single birds in western Prince William Sound on 4 December 2000; off transects, four in Harriman Fjord (Prince William Sound) on 5 December 2000. Much rarer than Isleib and Kessel (1973) suggested, perhaps because the species is rare offshore.

Glaucous-winged Gull *Larus glaucescens* (common fall and spring, uncommon winter): Seen during every cruise, although most common in October, April, and May (Figure 6). Represented 3.6% of all birds (seventh most abundant species), constituting as much as 10.2% of all birds on some cruises. Occurred widely from the Alaska Coastal Current (most common) to the Alaska Stream; in the Gulf of Alaska, the Glaucous-winged Gull is primarily a neritic species.

Glaucous Gull *Larus hyperboreus* (rare fall–spring): On transects, total of six: one in October, one in April, and four in May, all in 2000 and over the Alaska Coastal Current or mid-shelf. Off transects, one in Prince William Sound on 5 March 2001,

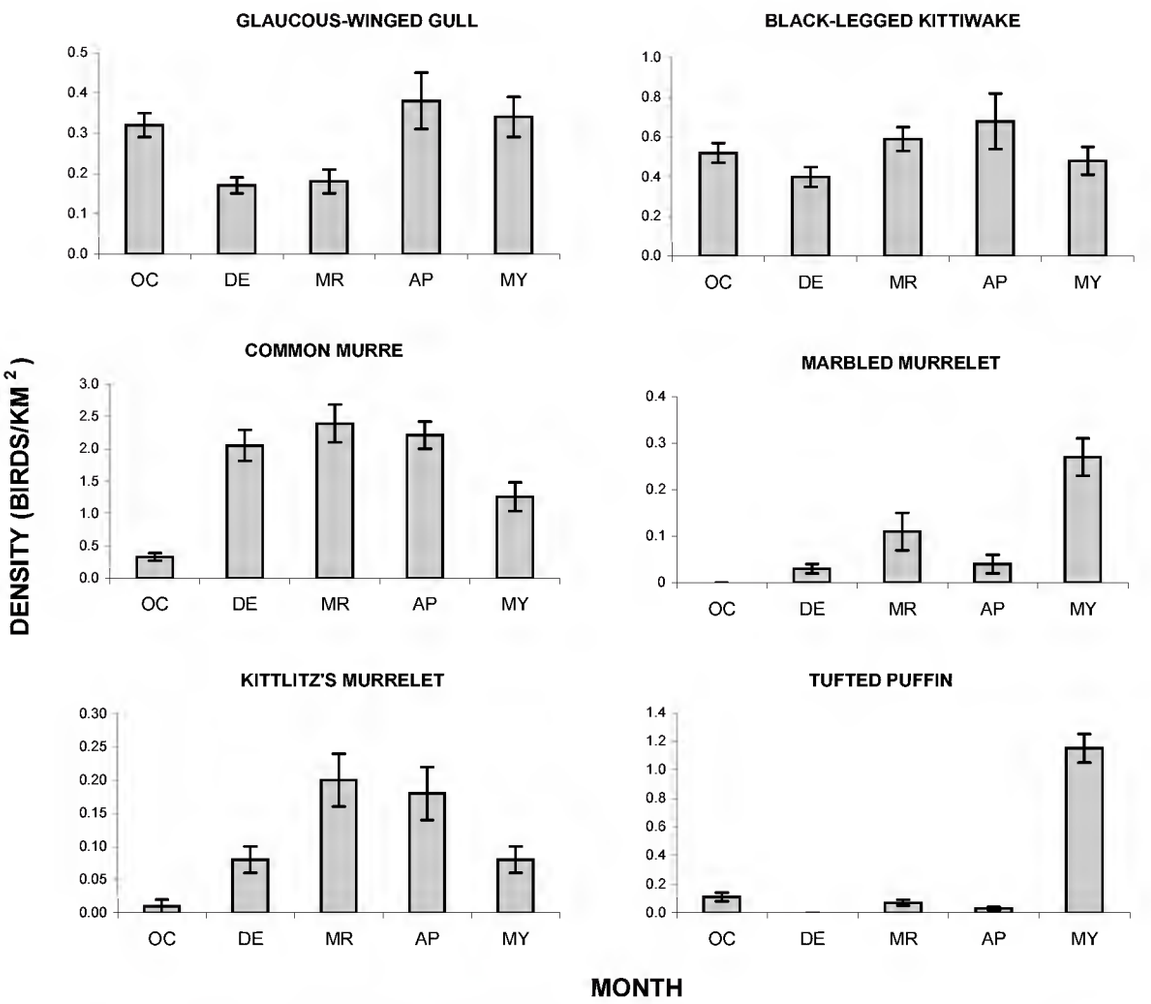

Figure 6. Mean (± 1 standard error) densities (birds/km^2) of 6 of the 13 most abundant seabird species in the northern Gulf of Alaska, October–May 1997–2001, by month.

several there on 10 May 1999, single birds over the mid-shelf and at the shelf break on 8 May 1999, and three ~35 km south of Cape Fairfield on 11 May 1999.

Sabine's Gull *Xema sabini* (rare spring; survey timing possibly incorrect for determining true abundance): On transects, total of 12, all from 22 to 25 May 2000. I suspect that other May cruises were too early for arrival of these migrants, although the species simply may be rare in this area at all times. Seen south of Montague Island, south of Hinchinbrook Entrance, and west of Kayak Island, over both the Alaska Coastal Current and mid-shelf water. All were in alternate plumage. Also suggesting late migration through region, D. D. Gibson (UAM, unpubl. data) recorded one in spring at Giacomini Seamount (56° 07' N, 147° 09' W), in the oceanic Gulf of Alaska, on 14 May 1986.

Black-legged Kittiwake *Rissa tridactyla* (uncommon–common fall–spring): Seen during every cruise, being most common in March and April, when it returned prior to breeding (Figure 6). Represented 7.0% of all birds (fifth most abundant species) and constituted up to 18.5% of all birds on some cruises. Primarily neritic, although less common inshore in December and March, suggesting inshore–offshore seasonal movement.

Arctic Tern *Sterna paradisaea* (rare spring): Total of 81, all spring migrants in May,

representing 0.5% of all birds. All but one were in the Gulf of Alaska. Many were migrating west, although some were headed east or northeast. Occurred primarily over mid-shelf water, occasionally in the Alaska Coastal Current; three were over deep water up to ~220 km offshore, on 7 May 1999.

Common Murre *Uria aalge* (uncommon fall, abundant winter and spring): Seen during every cruise, although most abundant in March and April (Figure 6). Represented 21.3% of all birds (most abundant species), constituting as much as 45.4% of all birds on some cruises. Occurred in both the Gulf of Alaska and Prince William Sound but rare in the sound in October and December, suggesting inshore–offshore seasonal movement. Also occurred primarily over the shelf, especially the mid-shelf, being rare at the shelf-break or in the Alaska Stream. Many were flying inshore as early as March, and seasonal movement inshore continued to May, prior to breeding. In October, most appeared to be unwilling or unable to fly, suggesting flightlessness at that time because of synchronous molt of flight feathers.

Thick-billed Murre *Uria lomvia* (rare winter and spring): Total 15 birds, occurring sporadically among the abundant Common Murres. Records ranged from December to May, with most in March and April. The Thick-billed occurred only in the Gulf of Alaska, where it ranged widely from the Alaska Coastal Current to the shelf break (one) and deep water ~165 km offshore (three); however, it was most frequent over the mid-shelf. Although Gould et al. (1982) suggested that Thick-billed Murres wintering in the gulf prefer waters deeper than does the Common Murre, my data do not support this claim.

Pigeon Guillemot *Cepphus columba* (rare winter and spring): On transects, total of six, all in March and May 1998. Occurred in both the Gulf of Alaska and Prince William Sound, all in the Alaska Coastal Current.

Marbled Murrelet *Brachyramphus marmoratus* (rare fall and winter, rare–common spring): Seen during 12 of 16 cruises and in all months, most commonly in spring (Figure 6). Represented 1.3% of all birds, constituting as much as 6.1% of all birds on some cruises. Occurred in both Prince William Sound and the Gulf of Alaska, where it occurred primarily in the Alaska Coastal Current and over the mid-shelf. Off transects, one was in central Prince William Sound on 5 December 1998 and 15–20 were in Harriman Fjord (an arm of the sound) on 5 December 2000.

Kittlitz's Murrelet *Brachyramphus brevirostris* (rare–uncommon fall–spring): Seen during 15 of 16 cruises and in all months, being most numerous in March and April (Figure 6), presumably as birds move inshore to bays prior to breeding. Represented 1.4% of all birds, constituting as much as 7.0% of all birds on some cruises. Occurred in both Prince William Sound and the Gulf of Alaska, being more common in the gulf, primarily in the Alaska Coastal Current and over the mid-shelf. One bird was ~180 km offshore at the shelf-break front on 9 March 1998, but I saw none in the Alaska Stream. Off transects, three basic-plumaged birds (presumably just molted) were flying east south of Montague Island on 16 October 1997, 12–15 were in central Prince William Sound on 5 December 1998, two were off the dock at Seward on 2 March 2001, one was south of Montague Island on 14 March 1998, and four (two obvious pairs) were in Icy Bay (an arm of the sound) on 18 April 1999. None, however, were in Harriman Fjord on 5 December 2000. Interestingly, the mean sea-surface temperature where I recorded this species during nonbreeding period (6.2° C overall) is essentially identical to mean temperature in which species occurs in Prince William Sound in summer (6.1° C overall; Day et al. 1999, 2003). Overall densities suggest that the northern Gulf of Alaska shelf is an important wintering area for this rare species (see Day et al. 1999), supporting perhaps several thousand.

Ancient Murrelet *Synthliboramphus antiquus* (rare fall, rare–uncommon spring):

On transects, total 52, with 3 in October 1997, the remainder spread across three May cruises; represented 0.3% of all birds. All records were from the Gulf of Alaska, primarily in mid-shelf water, secondarily in the Alaska Coastal Current. One was seen ~140 km offshore, just inshore of the shelf break.

Cassin's Auklet *Ptychoramphus aleuticus* (rare fall–spring): On transects, total 42, representing 0.3% of all birds. Noted on 11 of 16 cruises and in all months, being least numerous in December and March and most numerous in May. Occurred only in the Gulf of Alaska, from the Alaska Coastal Current to the Alaska Stream, most frequently from the outer part of the mid-shelf to oceanic water (up to ~220 km offshore). Appears to shift seasonally, moving off the shelf in fall (although the one December record was inshore) and back onto the shelf in spring.

Parakeet Auklet *Aethia psittacula* (rare fall–spring): On transects, total 17, in October, March, and May. Occurred only in the Gulf of Alaska, from the Alaska Coastal Current to the Alaska Stream; least frequent in the coastal current and equally frequent from the mid-shelf to the Alaska Stream, ranging up to ~185 km offshore. Appears to move seasonally, being farther offshore in October, absent in December, and back inshore in spring.

Crested Auklet *Aethia cristatella* (rare winter): On transects, total six: single birds at 58° 54' N, 148° 03' W and 58° 56' N, 148° 07' W on 3 December 1998 (both near the shelf break), one at 59° 24' N, 149° 05' W (over the mid-shelf) on 5 December 1999, one at 58° 55' N, 148° 35' W (near the shelf break) on 7 March 2001, and two at 58° 52' N, 148° 30' W (near the shelf break) on 9 March 2001. Off transects, one at 59° 51' N, 149° 28' W (~15 km offshore) on 30 November 1999 and one off the dock at Seward on 30 November 1998. These data suggest that the species is annual in the northern gulf, although previously it has been considered casual in winter (Isleib and Kessel 1973, Gould et al. 1982).

Rhinoceros Auklet *Cerorhinca monocerata* (rare fall and spring): On transects, total 22: rare in October, absent in December and March, and slightly more frequent in April and May. Most frequent over the mid-shelf and less so in the Alaska Coastal Current and Alaska Stream; seen up to ~200 km offshore.

Horned Puffin *Fratercula corniculata* (rare fall and spring, casual winter; spring survey schedule probably incorrect for determining true abundance): On transects, total 59, representing 0.4% of all birds: four in October 1997, three in December 2000, and the rest in May 2000. Occurred only in the Gulf of Alaska, where it ranged from the Alaska Coastal Current to the Alaska Stream; seen up to ~210 km offshore. It also appeared to move seasonally, leaving the shelf in winter. Noticeable inshore movement in May 2000 (the latest May cruise), with birds seen copulating on the water.

Tufted Puffin *Fratercula cirrhata* (rare fall and winter visitor, rare–abundant spring): Seen during 11 of 16 cruises and in all months, but abundant only in May (Figure 6). Even though it was not present all winter, it represented 3.9% of all birds seen during transects (sixth most abundant species) and constituted up to 15.3% of all birds on a cruise. Except for a single individual in Prince William Sound, all Tufted Puffins were in the Gulf of Alaska. The species moved seasonally, into the deep North Pacific to winter and back onto the shelf in spring.

DISCUSSION

The avifauna was dominated numerically by tubenoses, which collectively represented 50% of all marine-oriented birds seen. Alcids and larids brought

the total percent to 92% overall. Thus only two orders, the Procellariiformes and Charadriiformes, dominate this fauna. Five species each composed ≥5% of the total avifauna (Common Murre, Northern Fulmar, Fork-tailed Storm-Petrel, Sooty Shearwater, and Black-legged Kittiwake) and collectively composed nearly 74% of all birds seen on all cruises. Another nine species each composed 1.0–4.9% and collectively represented 19% of the total avifauna. The remaining 44 species could be considered trace elements and collectively represented 7% of the wintering avifauna. Hence, the nonbreeding seabird community of the northern Gulf of Alaska is simple and characterized by just a few species, most of which are tubenoses.

Species Richness

For all transects combined, species richness varied between 10 and 37 species per cruise, with an overall mean of 20.9 species per cruise. Richness varied strongly by season, decreasing from October to March, then increasing rapidly again to May, when wintering species are still present, breeding species are arriving, and migrant species are crossing the region. December and March, which have the lowest number of species, are dominated numerically by just a few species, indicating that only a few are able to thrive at this high a latitude during the coldest and darkest months of the year. Presumably much of the stress is caused by food limitation, but cold temperatures and short days that limit the time available for foraging also must be of some importance. The avifauna during both months is dominated numerically by the Northern Fulmar, Black-legged Kittiwake, and Common Murre, with the Laysan and Black-footed albatrosses, Glaucous-winged Gull, and Kittlitz's Murrelet forming a small but regular part of the avifauna.

Regular Species

Fourteen species constitute the core of the wintering avifauna, forming 93% of all wintering birds. Most occur all winter, although some (e.g., Sooty Shearwater, Red Phalarope, Tufted and Horned puffins) are absent during one or more of the months. Several other species were present all winter but clearly were more abundant during some seasons (usually October, April, and/or May). For example, some species, such as the Tufted Puffin, move off the shelf to winter in the deep North Pacific, returning to the shelf again only in April and May. Most Black-legged Kittiwakes also leave the northern gulf to winter farther out at sea and down the western coast of North America, although they return in numbers in March, earlier than the puffins; consequently, they were detected continuously during these surveys and were present in low numbers all winter. Only a few species were present in substantial numbers during most or all of the winter: the Common Murre, Northern Fulmar, and Glaucous-winged Gull.

My work suggests that the shelf of the northern Gulf of Alaska is an important wintering area for Kittlitz's Murrelet, as suspected previously (Day et al. 1999). This species clearly wintered in numbers over the open shelf of the gulf and secondarily in Prince William Sound. Given the substantial area of continental shelf in the study area and the mean densities recorded in this study, it is probable that several thousand winter here.

Rare Species

These 44 species fell into several categories. Some winter in the Gulf of Alaska, sometimes in numbers, but only within protected bays or in coastal waters; the seaducks and cormorants are prominent members of this group. Some winter elsewhere and pass through the northern gulf only in fall and/or spring. Numerous species, such as the Red-necked Phalarope and Sabine's Gull, fall into this category. Some species winter in the gulf but are generally rare everywhere; the Yellow-billed Loon falls into this group. Finally, a few species are accidental to casual, with few or no further records predicted; the Buller's and Little shearwaters and Black-headed Gull constituted this group. My observation of the Little Shearwater constitutes the second sight record of that species for Alaska. Both shearwaters' occurring during the strong El Niño of 1997 suggests a northward movement with the unusually warm water found in the Gulf of Alaska that fall. In addition, a leatherback sea turtle (*Dermochelys coriacea*) was recorded at Montague Island around the same time (article in Cordova newspaper that fall), suggesting that seabirds were not the only organisms moving north with El Niño.

Some species were surprisingly rare or absent. For example, I did not record the Aleutian Tern (*Sterna aleutica*), which does not migrate along the coast but instead comes inshore from the deep ocean (D. D. Gibson, UAM, pers. comm.). In contrast, the absence of grebes suggests that they migrate so coastally that they were not detected in this study. I also saw surprisingly few migrating Arctic Terns. As indicated above, the dearth of Sabine's Gulls possibly resulted from timing of the sampling rather than from low numbers migrating through the area.

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AUTUMN LANDBIRD COMMUNITIES IN THE BOISE FOOTHILLS AND OWYHEE MOUNTAINS OF SOUTHWESTERN IDAHO

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ABSTRACT: Identifying important stopover areas is a critical step in conservation and management of migratory birds, and relatively little effort has been directed toward this task in Idaho or the Intermountain West. We used mist-net captures to describe the relative abundance, species richness, and community similarity of autumn migrant landbirds in the Boise Foothills and Owyhee Mountains of southwestern Idaho, two mountain ranges separated by the Snake River Plain. We captured birds at three mist-net sites from August to October 1998. Two sites were situated in the Boise Foothills, one in deciduous mountain shrubland, the other in an adjacent willow-dominated riparian draw; the third site was at a riparian spring in the Owyhee Mountains. Capture rates for resident species, temperate-zone migrants, and irruptive migrants were highest at the Boise Foothills riparian site, whereas the Boise Foothills mountain shrubland site had the highest abundance of neotropical migrants. Species richness was highest at the two Boise Foothills sites, but at all sites diversity and evenness were similar. Among the three sites, the two Boise Foothills sites (mountain shrubland and willow riparian) had the most similar bird communities. Capture rates were high (> 1 bird per mist-net hour) at all three sites, and these results demonstrate that many species of autumn migrants occur frequently in montane deciduous habitats across southwestern Idaho.

The distribution and abundance of migrating landbirds is generally understudied in the Intermountain West. Most neotropical and temperate-zone migrant passerines common to the western United States pass through Idaho during fall migration (Burleigh 1972, Stephens and Sturts 1998, Carlisle et al. 2004), yet their specific habitat associations, timing, and relative abundance are only beginning to be thoroughly described (Carlisle et al. 2004, 2005). Because migrating landbirds need suitable stopover sites for rest and refueling, identification and protection of suitable stopover habitat is an important link in the conservation of migratory birds (Moore et al. 1995, Hutto 1998, Petit 2000). To increase our understanding of migrants' distribution in the Intermountain West, we examined autumn migrant landbird occurrence in two montane areas of southwestern Idaho.

The Boise Foothills and Owyhee Mountains lie on the north and south sides, respectively, of the Snake River Plain in southwestern Idaho (Figure 1). The degree to which the Snake River Plain, representing the northern edge of the Basin and Range Province, affects landbird migration and distribution

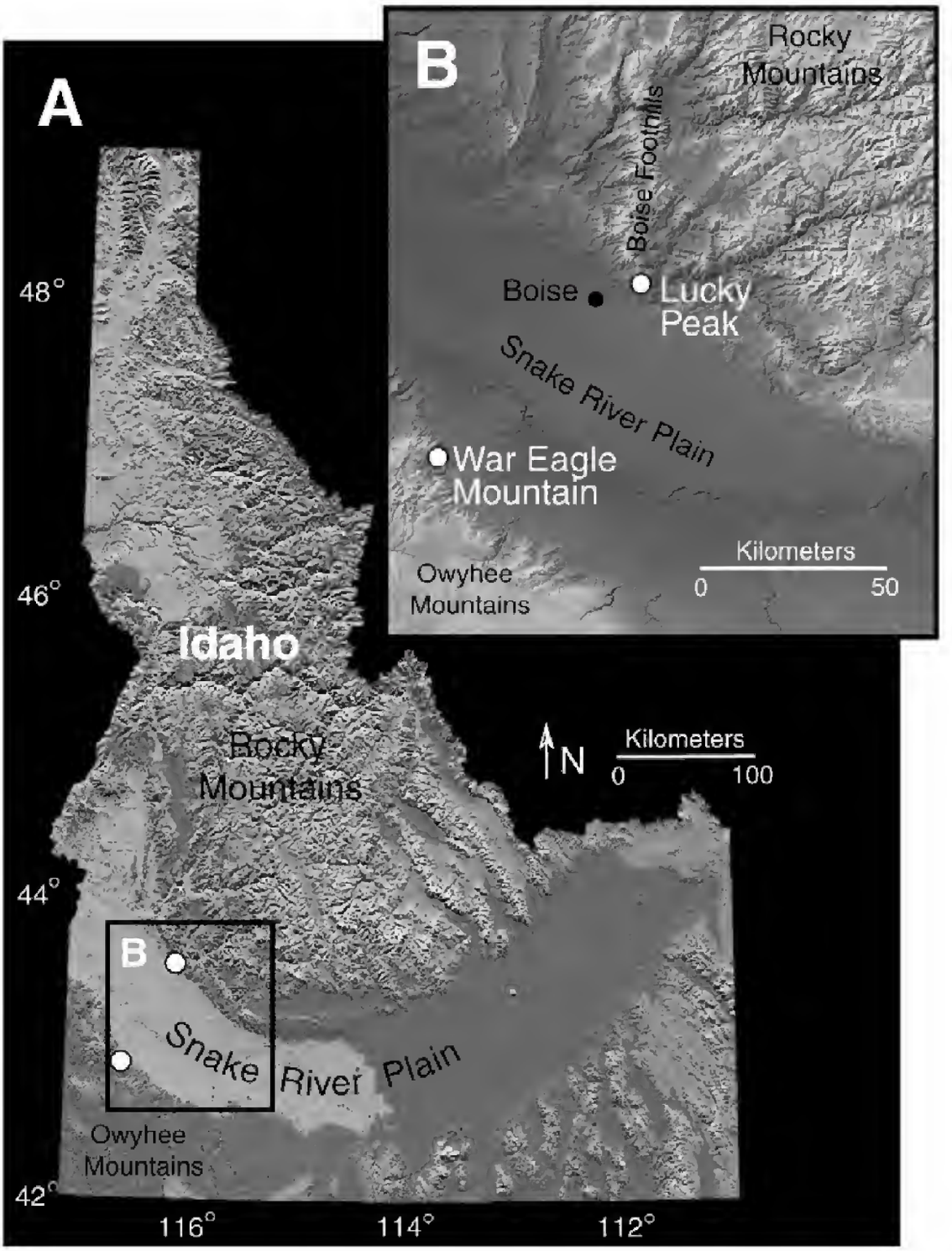

Figure 1. Location of study sites (white circles) relative to the Snake River Plain in Idaho.

is mostly unexplored. Habitats in the Snake River Plain, with the exception of the relatively narrow riverine corridor, are composed mostly of desert and agricultural lands that are likely unsuitable for most woodland migrants. Long-term research and monitoring of autumn migrants' habitat associations and stopover ecology was already underway in the Boise Foothills (Carlisle et al. 2004), so in this study we compared the migrant-bird community in the Owyhee Mountains to that in the Boise Foothills during fall 1998.

We used mist-nets to survey migrant landbirds at two sites in the Boise Foothills and one site in the Owyhee Mountains from August through October 1998. We compared the species composition, relative abundance, community similarity, and migration timing for neotropical and temperate-zone migrants at these sites.

STUDY SITES AND METHODS

Study Sites

Two mist-net sites were located on Lucky Peak in the Boise Foothills, east of Boise, Ada County, and a third was located on War Eagle Mountain in the Owyhee Mountains south of Boise (Figure 1). Lucky Peak (1845 m) lies 12 km east of Boise (43° 36' N, 116° 05' W) and is the southernmost peak along the Boise Foothills. The Boise Foothills, trending north–south in the Boise Mountains, form the northern boundary of the Snake River Plain and the southernmost extension of the central Idaho mountains. The study site is at the boundary between two major habitat zones: the largely forested mountains to the north and the shrubsteppe-dominated Great Basin to the south. Four distinct habitat types occur in a mosaic at Lucky Peak and along the Boise Foothills in general: coniferous forest, deciduous mountain shrubland, shrubsteppe, and riparian shrubland (see Carlisle et al. 2004 for more detailed descriptions of habitats). One netting site was located in mountain shrubland near the top of Lucky Peak. The second site was in a spring-fed, willow-dominated riparian draw on the western slope of Lucky Peak. The centers of these two sites were separated by about 600 m (nearest nets about 400 m apart), and recaptures of banded birds traveling between sites were rare (Carlisle, unpubl. data). Although habitats at these two sites differed, the surrounding landscape, local weather, and migration routes likely affected both sites similarly.

The Owyhee Mountains lie to the south/southwest of the Boise Foothills and are separated from the Boise Foothills by the Snake River Plain. Thus the Owyhees are at the northern edge of the Great Basin province. The study site in the Owyhees was located on the slope of War Eagle Mountain at about 2073 m in elevation (43° 01' N, 116° 42' W), near the northern edge of forest in the Owyhee Mountains. The site is characterized by a riparian spring dominated by willows surrounded mostly by a grassy meadow, shrubsteppe and, on one side, by high-elevation coniferous forest dominated by subalpine fir (*Abies lasiocarpa*). The Owyhee site is approximately 84 km from the two Boise Foothill sites, and may be subject to slightly different local weather patterns and migration pulses than the Boise Foothills sites.

METHODS

We captured birds in standard mist-nets (12 × 2.6m, 32 mm mesh) at each of the three study sites in the fall of 1998. We used ten nets at the Boise Foothills mountain shrubland site, six at the Boise Foothills riparian site, and five at the Owyhee site. Because the riparian habitat at the Boise Foothills and Owyhee sites is constricted, nets were more spread out at the mountain shrubland site, and the area covered by the netting scheme was approximately twice that at the other sites. Therefore, the number of nets

was approximately proportional to the extent of the mist-netting area at each site. We located nets nonrandomly and opportunistically throughout the habitats in areas that concentrated bird movement for efficient captures (Ralph et al. 1993) and kept net placement constant during the study. All nets at the Boise Foothills sites were in deciduous shrubs (mountain shrubland or riparian), whereas in the Owyhees four nets were in willows and one net was in the adjacent fir forest. The similar habitat structure and similar behavior of birds (migratory stopover) at all three sites should overcome most of the cautions outlined by Remsen and Good (1996) for among-site comparisons of mist-netting data (see also Carlisle et al. 2004). Nets were opened at sunrise and closed 5 hours after sunrise. Nets were not opened during inclement weather. The mountain shrubland site was operated daily from 5 August 5 to 15 October; the Boise Foothills riparian site was operated daily from 21 August to 14 October; and the Owyhee site was operated on a three-day-on, four-day-off schedule from 12 August to 15 October. Only data from banding days in common at all three sites (a total of 23 banding days from 25 August to 15 October) were used in analyses. We identified captured birds to species with reference to Pyle (1997) and fitted each with individually numbered U.S. Geological Survey aluminum leg bands. Capture effort (in mist-net hours; 1 net open for 1 hour = 1 mist-net hour) was recorded for each station.

Analyses

We assigned species to one of three categories for comparisons: neotropical migrants (more or less long-distance migrants), temperate-zone migrants (more or less short-distance migrants), or residents/irruptive migrants. We categorized neotropical migrants according to DeGraaf and Rappole (1995) but applied more stringent criteria such that at least half of the population's winter distribution must occur south of the United States for the species to be considered a neotropical migrant (see Carlisle et al. 2004).

We used capture data from each site to compare species richness (number of species), diversity (Shannon index, H), evenness (J), and Morisita's index of community similarity (I_M) (Brower et al. 1998). Values of both J and I_M range from 0 to 1; values close to 1 are most even or similar, respectively. To correct for unequal sample sizes and netting effort among sites, we used rarefaction to compare expected numbers of species ($E[S_n]$) at a given sample size (James and Rathbun 1981, Carlisle et al. 2004). Chi-squared goodness-of-fit tests were used to compare capture totals (adjusted for effort; projected captures at 1000 mist-net hours) among sites for all species pooled and each category of migrant (Carlisle et al. 2004). All tests used $P \leq 0.05$ for statistical significance, and we used the sequential Bonferroni procedure to maintain an overall alpha of 0.05 in χ^2 tests that relied on multiple comparisons within the same data set (Rice 1989).

RESULTS

Relative Abundance and Species Composition

At all three sites combined, we captured a total of 3090 birds of 53 species in 2146.3 mist-net hours (mnh), an overall capture rate of 1440 birds/1000

mnh (Table 1). Total captures (corrected for equal effort: birds/1000 mnh) differed significantly ($\chi^2 = 53.51$, d.f. = 2, $P < 0.01$), with Owyhee having the lowest rate and Boise Foothills willow riparian the highest (Table 1). For each category of migrant, capture rates (birds/1000 mnh) also differed significantly from site to site. Neotropical migrants were captured most frequently at the Boise Foothills mountain shrubland site ($\chi^2 = 57.52$, d.f. = 2, $P < 0.01$), whereas temperate-zone migrants ($\chi^2 = 14.94$, d.f. = 2, $P < 0.01$) and residents/irruptive migrants ($\chi^2 = 77.01$, d.f. = 2, $P < 0.01$) were most frequent at the willow riparian site (Table 1).

The proportion of each category of migrant differed slightly from site to site such that captures at the Boise Foothills sites were made up of a higher proportion of neotropical migrants (mountain shrubland 21.0%, willow riparian 17.4%) than at the Owyhee site (12.3%). In contrast, captures at the Owyhee site consisted of a higher proportion of temperate migrants (82.9% vs. 76.6% for mountain shrubland and 74.0% for willow riparian), and willow riparian had the highest proportion of resident/irruptive species (8.6% vs. 4.8% in the Owyhees and 2.3% in mountain shrubland). If captures from both Boise Foothills sites are combined, the foothills captures were composed of 19.7 % neotropical migrants, 75.6 % temperate-zone migrants, and 4.7 % residents. The Green-tailed Towhee (*Pipilo chlorurus*; 11 captures) was the only species unique to the Owyhee site (Table 1). In contrast, 25 species captured at one or both foothills sites were not encountered at Owyhee; however, only two of these (the Nashville, *Vermivora ruficapilla*, and Townsend's, *Dendroica townsendi*, warblers) were represented by ≥10 individuals at any site (Table 1).

Richness, Diversity, and Community Dominance

Species richness (not corrected for sample size) was 47 species at mountain shrubland, 41 species at willow riparian, and 28 species at Owyhee. Because of unequal netting effort and sample sizes, we used rarefaction curves to compare expected numbers of species ($E[S_n]$) at similar sample sizes (see Figure 2.). For example, the $E[S_n]$ at an N of 400 total birds was 34 species for both Boise Foothills sites and 26 species for Owyhee (Figure 2). Thus the Owyhee site appeared to support fewer species than the two Boise Foothills sites. Shannon diversity values (H) were 2.397 for mountain shrubland, 2.432 for willow riparian, and 2.247 for Owyhee. Evenness (J) was 0.626 for mountain shrubland, 0.655 for willow riparian, 0.674 for Owyhee. Thus diversity and evenness values were roughly similar at all sites, although diversity was slightly lower and evenness was slightly higher at Owyhee. Morisita's index of community similarity (I_M) for all captures was 0.848 between mountain shrubland and willow riparian, 0.573 between mountain shrubland and Owyhee, and 0.456 between willow riparian and Owyhee. Thus the two Boise Foothills sites were much more similar to each other than either was to the Owyhee site.

Migration Timing

The migration schedule of neotropical migrants was similar at all sites (Figure 3). Capture rates for neotropical migrants were highest at the begin-

Table 1 Numbers and Rates of Birds Captured in the Boise Foothills and Owyhee Mountains, Southwestern Idaho, August–October 1998[a]

		Totals			Capture rate[c]		
Species	Category[b]	MS	WR	OWY	MS	WR	OWY
Sharp-shinned Hawk *Accipiter striatus*	T	3	0	0	2.84	0.00	0.00
Cooper's Hawk *A. cooperii*	T	1	0	0	0.95	0.00	0.00
Northern Pygmy-Owl *Glaucidium gnoma*	R	1	1	0	0.95	1.74	0.00
Calliope Hummingbird *Stellula calliope*	N	2	0	0	1.89	0.00	0.00
Rufous Hummingbird *Selasphorus rufus*	N	1	0	0	0.95	0.00	0.00
Downy Woodpecker *Picoides pubescens*	R	0	0	1	0.00	0.00	1.94
Red-naped Sapsucker *Sphyrapicus nuchalis*	N	4	2	0	3.78	3.49	0.00
Western Wood-Pewee *Contopus sordidulus*	N	3	5	0	2.84	8.72	0.00
Dusky Flycatcher *Empidonax oberholseri*	N	41	13	12	38.75	22.67	23.29
Hammond's Flycatcher *E. hammondii*	N	21	11	3	19.85	19.18	5.82
Western Flycatcher *E. difficilis/occidentalis*	N	1	0	0	0.95	0.00	0.00
Willow Flycatcher *E. traillii*	N	1	0	0	0.95	0.00	0.00
Cassin's Vireo *Vireo cassinii*	N	21	5	3	19.85	8.72	5.82
Warbling Vireo *V. gilvus*	N	37	10	8	34.97	17.44	15.52
Steller's Jay *Cyanocitta stelleri*	R	1	0	0	0.95	0.00	0.00
Mountain Chickadee *Poecile gambeli*	R	3	1	20	2.84	1.74	38.81
Black-capped Chickadee *P. atricapillus*	R	1	0	0	0.95	0.00	0.00
Red-breasted Nuthatch *Sitta canadensis*	R	13	54	4	12.29	94.16	7.76
Brown Creeper *Certhia americana*	R	15	17	1	14.18	29.64	1.94
Winter Wren *Troglodytes troglodytes*	T	2	3	0	1.89	5.23	0.00
House Wren *T. aedon*	N	7	3	3	6.62	5.23	5.82
Golden-crowned Kinglet *Regulus satrapa*	T	21	32	3	19.85	55.80	5.82
Ruby-crowned Kinglet *R. calendula*	T	501	129	137	473.53	224.93	265.85
Townsend's Solitaire *Myadestes townsendi*	T	39	2	1	36.86	3.49	1.94
American Robin *Turdus migratorius*	T	3	1	0	2.84	1.74	0.00
Swainson's Thrush *Catharus ustulatus*	N	9	2	0	8.51	3.49	0.00

Table 1 (*Continued*)

Species	Category[b]	Totals			Capture rate[c]		
		MS	WR	OWY	MS	WR	OWY
Hermit Thrush *C. guttatus*	T	19	6	15	17.96	10.46	29.11
Cedar Waxwing *Bombycilla cedrorum*	T	2	0	0	1.89	0.00	0.00
Nashville Warbler *Vermivora ruficapilla*	N	16	7	0	15.12	12.21	0.00
Orange-crowned Warbler *V. celata*	N	48	10	14	45.37	17.44	27.17
Yellow Warbler *Dendroica petechia*	N	6	5	1	5.67	8.72	1.94
Yellow-rumped Warbler *D. coronata*	T	16	14	101	15.12	24.41	195.99
Blackpoll Warbler *D. striata*	N	0	1[d]	0	0.00	1.74	0.00
Townsend's Warbler *D. townsendi*	N	19	4	0	17.96	6.97	0.00
MacGillivray's Warbler *Oporornis tolmiei*	N	32	16	17	30.25	27.90	32.99
Wilson's Warbler *Wilsonia pusilla*	N	16	4	4	15.12	6.97	7.76
Western Tanager *Piranga ludoviciana*	N	19	12	0	17.96	20.92	0.00
Black-headed Grosbeak *Pheucticus melanocephalus*	N	5	2	0	4.73	3.49	0.00
Lazuli Bunting *Passerina amoena*	N	7	10	0	6.62	17.44	0.00
Spotted Towhee *Pipilo maculatus*	T	66	27	3	62.38	47.08	5.82
Green-tailed Towhee *P. chlorurus*	T	0	0	11	0.00	0.00	21.35
Chipping Sparrow *Spizella passerina*	N	6	20	1	5.67	34.87	1.94
Brewer's Sparrow *S. breweri*	N	1	16	9	0.95	27.90	17.46
Vesper Sparrow *Pooecetes gramineus*	T	4	4	0	3.78	6.97	0.00
Savannah Sparrow *Passerculus sandwichensis*	T	0	1	0	0.00	1.74	0.00
White-crowned Sparrow *Zonotrichia leucophrys*	T	105	164	72	99.29	285.96	139.72
Golden-crowned Sparrow *Z. atricapilla*	T	1	1	0	0.95	1.74	0.00
Fox Sparrow *Passerella iliaca*	T	10	1	12	9.45	1.74	23.29
Lincoln's Sparrow *Melospiza lincolnii*	N	2	2	2	1.89	3.49	3.88
Dark-eyed Junco *Junco hyemalis*	T	390	296	164	368.62	516.13	318.24
Pine Siskin *Carduelis pinus*	R	0	2	2	0.00	3.49	3.88

Table 1 (*Continued*)

Species	Category[b]	Totals MS	Totals WR	Totals OWY	Capture rate[c] MS	Capture rate[c] WR	Capture rate[c] OWY
Cassin's Finch *Carpodacus cassinii*	R	2	0	2	1.89	0.00	3.88
Red Crossbill *Loxia curvirostra*	R	0	4	0	0.00	6.97	0.00
Sum of captures		1544	920	626	1460[e]	1604[e, f]	1215[e]
Mist-net hours (mnh)		1057.5	573.5	515.3	–	–	–
Capture rate (birds/1000 mnh)[e]		1460	1604	1215	–	–	–
Neotropical migrants		325	160	77	307.34[e,f]	278.99[e]	149.43[e]
Temperate-zone migrants		1183	681	519	1118.68[e]	1187.45[e, f]	1007.18[e]
Residents/irruptive migrants		36	79	30	34.04[e]	137.75[e, f]	58.2[e]
Number of species (uncorrected)		47	41	28	–	–	–
Projected $E[S_n]$ at N of 400 (rarefaction)		34	34	26	–	–	–

[a]MS, mountain shrubland, Lucky Peak, Boise Foothills; WR, willow riparian, Lucky Peak, Boise Foothills; OWY, War Eagle Mountain, Owyhee Mountains.

[b]N, neotropical migrant; T, temperate-zone migrant; R, resident/irruptive migrant.

[c]Birds per 1000 mist-net hours.

[d]Captured on 2 September 1998; one of four Blackpoll Warblers captured on Lucky Peak 29 August–5 September 1998 (others captured on dates not included in this analysis). These are the first Blackpoll Warblers to be substantiated in Idaho (Trochlell 1999), although the species is now known to be a rare but nearly annual fall migrant in the state.

[e]Projected number of new captures in 1000 mist-net hours.

[f]Highest capture rate in this comparison; capture rates differed significantly according to a χ^2 test after sequential Bonferroni procedure.

ning of the study (end of August) and declined steadily throughout September (Figure 3). Temperate-zone migrants peaked between early September and early October, but capture rates at the Owyhee site peaked and waned earlier than at the two Boise Foothills sites (Figure 4). The early peak at the Owyhee site was driven largely by Yellow-rumped Warblers (*Dendroica coronata*), which were captured more frequently at the Owyhee site than at either Boise Foothills site (Table 1).

DISCUSSION

The assemblage of migrants at all sites consisted of a similar group of species, but the abundance of many species differed from site to site. Although distance from breeding area to stopover site is a factor contributing to differences from site to site in the occurrence of migrants (Kelly et al. 1999), the only known difference in the list of breeding birds between the two mountain ranges we studied is the absence of the Green-tailed Towhee in the Boise Foothills (the Green-tailed Towhee breeds both north and south of the Snake River but occurs only rarely in the Boise Foothills). Thus the differences we observed between the two ranges in species composition of migrants were unlikely to have been driven primarily by differences in breeding ranges.

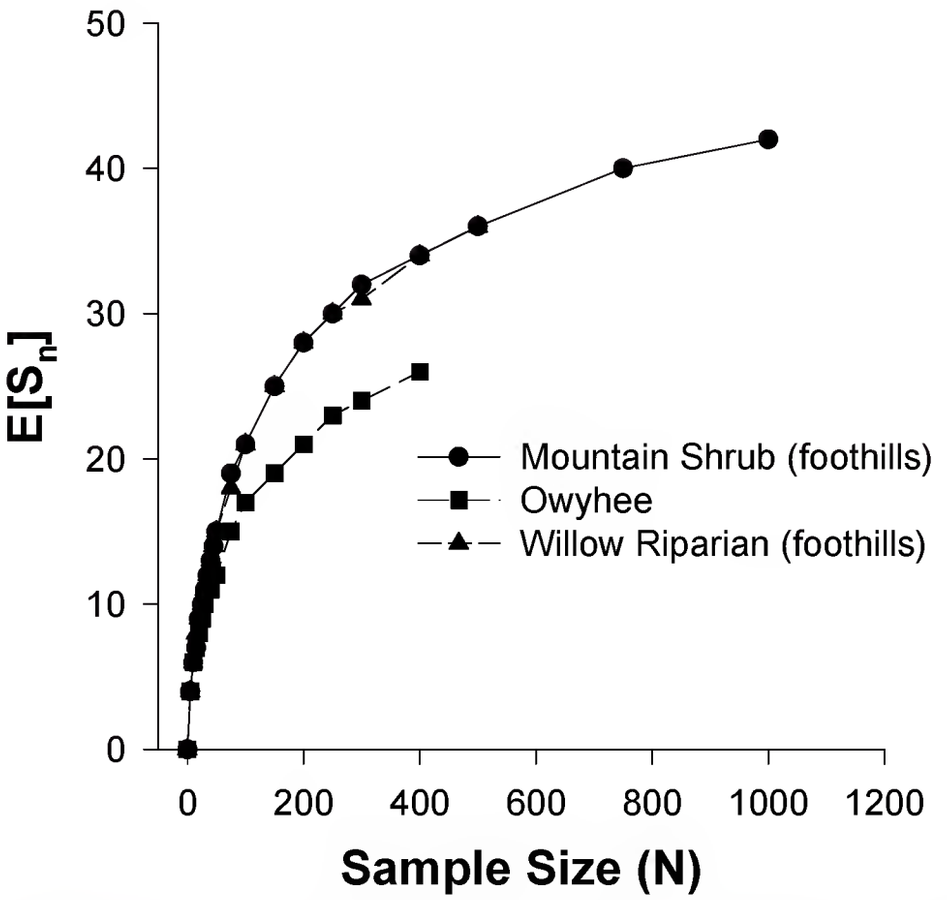

Figure 2. Rarefaction curves for capture data (all species) from mountain shrub, willow riparian (both Boise Foothills), and Owyhee banding sites. Curves compare species richness by providing the expected number of species ($E[S_n]$) detected for a given sample size (number of total birds captured; N).

Capture rates were high in both mountain ranges, but we detected more migrants in the Boise Foothills, suggesting that migrants use this area more heavily than the Owyhees. Since this study is based on a single season, some differences might disappear with more years of study. On the other hand, results of long-term monitoring in the mountain shrubland of the Boise Foothills have been relatively consistent from year to year for most species (Carlisle et al. 2004, 2005).

Although this study did not sample from late July through mid-August, a period during which several neotropical migrants pass through the region, most such migrants were still migrating through until mid- or late September (Carlisle et al. 2005). Neotropical migrants were more abundant and represented by more species at both Boise Foothills sites than at the Owyhee site. Future study would be required to determine if this pattern holds throughout the entire season of these species' migration (mid-July through late September; Carlisle et al. 2005). For temperate-zone migrants, the pattern of higher abundance in the Boise Foothills is similar but less striking. We are unable to infer differences in habitat suitability or migration volume between these ranges, however, without further sampling.

Interestingly, we captured three conifer-associated species most frequently

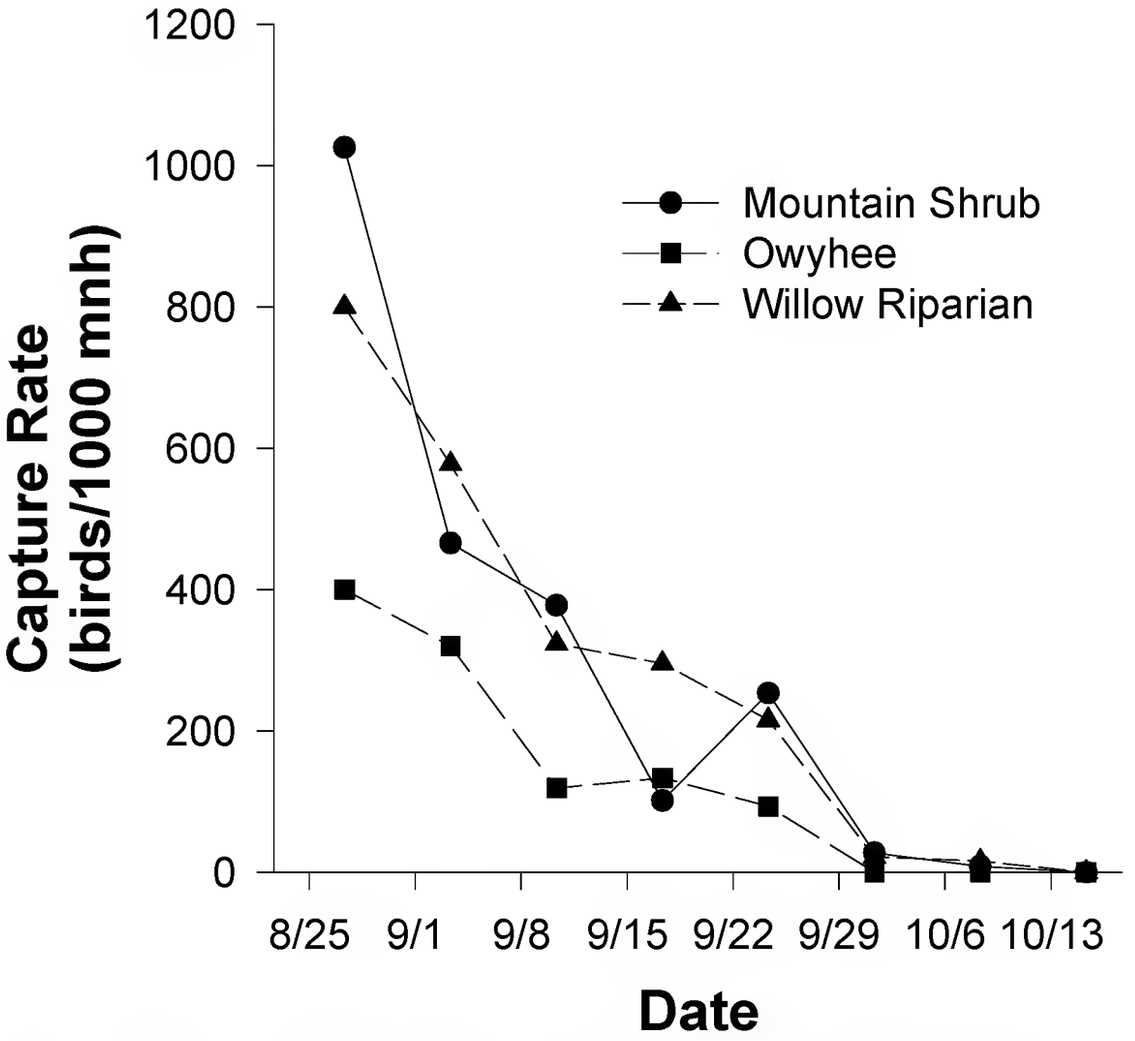

Figure 3. Capture rates (birds/1000 mist-net-hours) for neotropical migrants by week from willow riparian, mountain shrub (both Boise Foothills), and Owyhee banding sites. Capture data used are from three consecutive banding days separated by four-day intervals. Date is first of each three-day session.

in the willow riparian habitat in the Boise Foothills: the Red-breasted Nuthatch (*Sitta canadensis*), Brown Creeper (*Certhia americana*), and Golden-crowned Kinglet (*Regulus satrapa*) (Table 1). Both the nuthatch and creeper were experiencing irruptions during 1998.

Because of the short distance between the mountain shrubland and willow riparian banding sites, it is not surprising that the community overlap between these sites was greatest. It is interesting, however, that the communities at the two sites in the most similar habitats (willow riparian and Owyhee) overlapped the least.

Implications

This study provides further evidence that western landbirds use montane habitats during autumn migration (Austin 1970, Blake 1984, Hutto 1985, Carlisle et al. 2004). In comparing the composition of migrants in the two mountain ranges we studied, we were limited by having sampled at only three sites, two of which are adjacent and arguably dependent in many regards.

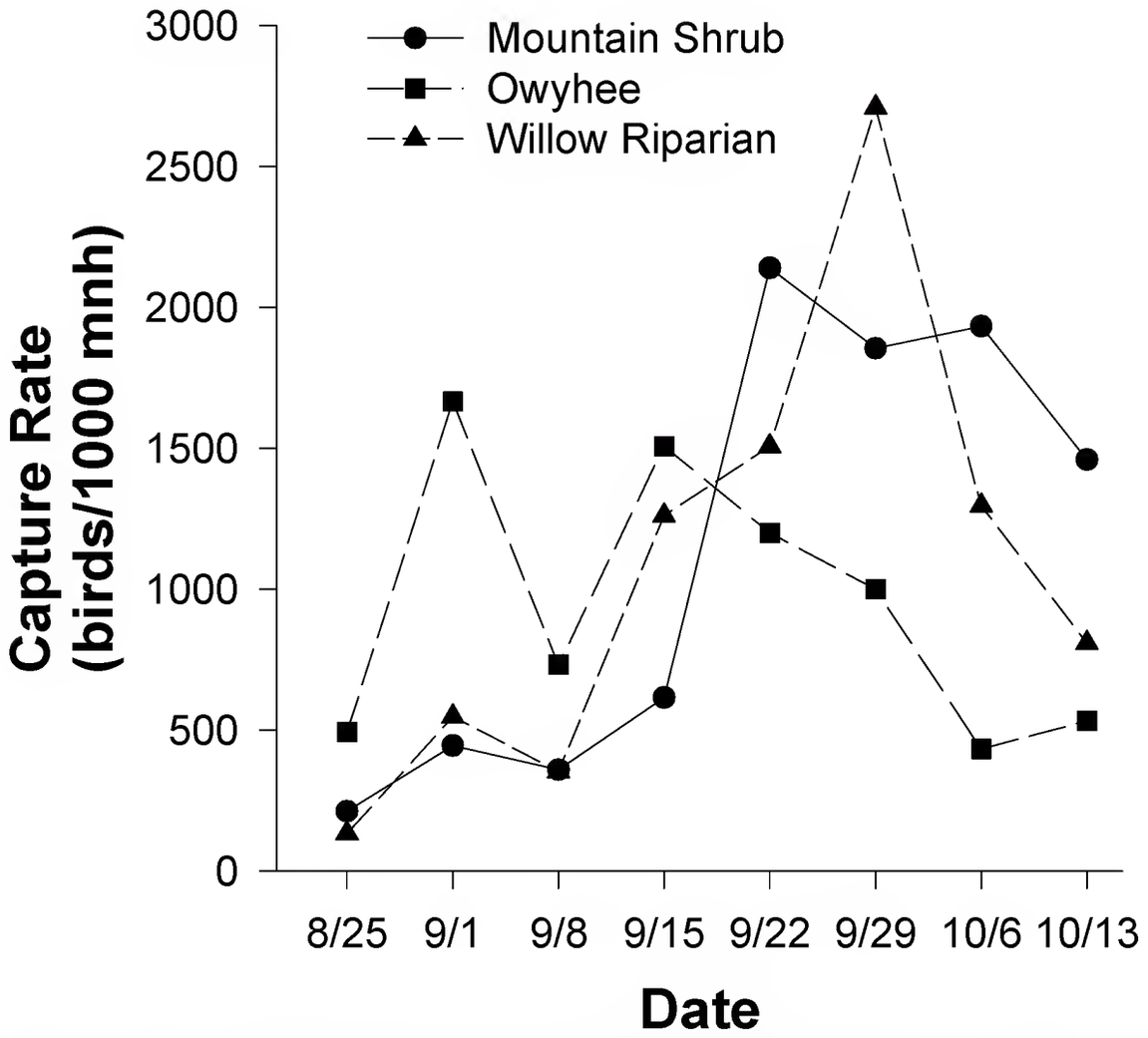

Figure 4. Capture rates (birds/1000 mist-net-hours) for temperate-zone migrants by week from willow riparian, mountain shrub (both Boise Foothills), and Owyhee banding sites. Capture data used are from three consecutive banding days separated by four-day intervals. Date is first of each three-day session.

Factors deserving further study include habitat quality, habitat diversity, and geographical isolation (Johnson 1975, Brown and Kodrick-Brown 1977, Behle 1978, Kelly et al. 1999). For instance, Johnson (1975) found fewer species of forest birds breeding on small isolated ranges within the Great Basin than in the continuous forests of the Rocky Mountains or Sierra Nevada but that habitat quality and diversity are factors more important than isolation distance in explaining the difference. Too little is known about autumn migration routes among western passerines for speculation about how the Snake River Plain affects migrants' orientation. Thus what ramifications, if any, the relative isolation of the Owyhees has for migrating landbirds are unknown. Since migrating birds are likely less affected by isolation than are residents (Behle 1978) or breeding birds, the effects of habitat diversity, quality, and isolation should be examined further for migrants.

Given migrants' capacity for long-distance travel (Bolshakov et al. 2003a, b), it seems unlikely that a desert 80 km wide would prove to be a substantial barrier. But even narrow bodies of water may funnel the paths of actively mi-

grating birds around lakes (Kerlinger 1989). How a desert crossing compares to water in the decision-making of a migrating bird is unknown, but crossing a desert seems less risky. Does the desert dividing the Rocky Mountains and isolated ranges of the Great Basin influence migratory behavior enough to result in a greater concentration of migrants on the north side during fall? If so, would we see a reverse pattern (of higher bird concentration in the Owyhees and other isolated ranges south of the Snake River) during spring migration?

Even if the Snake River Plain does influence migratory behavior, it seems likely that, as with distributions of breeding birds (Johnson 1975), migration patterns of woodland birds in the Intermountain West are shaped primarily by the distribution and abundance of suitable woodland habitats. Given the habitat and climatic gradients in this region, further study of migrants' habitat use seems warranted.

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EXPANSION OF THE BREEDING RANGE OF THE HOODED MERGANSER WITHIN CALIFORNIA

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ABSTRACT: Published records and data from the California Waterfowl Association's program monitoring nest boxes show that the Hooded Merganser (*Lophodytes cucullatus*) has become a regular and widespread breeder in California. More than 100 recorded nestings between 1996 and 2004 were distributed over 20 counties and yielded more than 800 hatchlings. Nest-box data show a dramatic increase in successful nesting attempts by the Hooded Merganser over this period. Banding data show a high degree of nest-site fidelity among females. Christmas Bird Count data reveal a statistically significant increase in the winter abundance of the Hooded Merganser in California since the early 1980s. This expansion of the breeding range is probably due to some combination of increasing breeding habitat and nest boxes and an increase in the species' population in the western portion of its range.

Current field guides (Sibley 2003, Dunn et al. 2002) and species accounts (Dugger et al. 1994) show the breeding range of the Hooded Merganser extending along the Pacific coast of North America from southeastern Alaska and British Columbia south to Oregon. In Oregon the Hooded Merganser is a locally uncommon and sparsely distributed summer resident in all but the southeast corner of the state (Marshall et al. 2003). Historically, the Hooded Merganser was not known to breed in California (Dawson 1923, Grinnell and Miller 1944) despite nesting nearby in southern Oregon. Breeding in California was not confirmed until 1964, at Mountain Meadows Reservoir, Lassen County (DeBenedictis and Chase 1964). Since that time, only 11 records (included in Table 1) of attempts by Hooded Mergansers to breed in California have been published, with eight of those since 1998. Stallcup (2002) cited these and other unpublished records as evidence of expansion of the breeding range of the Hooded Merganser into California. To establish that California has become a part of the species' regular breeding range, we reviewed previously published records and supplemented them with extensive data from the California Waterfowl Association's (CWA) nest-box-monitoring program.

METHODS

Trained volunteer cooperators monitored use by the Wood Duck (*Aix sponsa*) of nest boxes throughout California from 1991 to 2004. These observations were part of a statewide cooperative program to monitor the resident Wood Duck population. The data collected allowed documentation of breeding of a variety of other cavity-nesting birds, including the Hooded Merganser. Cooperators monitored nest boxes at over 200 sites in 40 of California's 58 counties. Nest-box locations encompassed a range of habi-

Table 1 Records of the Hooded Merganser Breeding in California

Year	Breeding Attempts	Hatchlings	Location	Source
1964	1	9	Mountain Meadows (Lassen)	DeBenedictis and Chase 1964
1974	1	?	Lake Earle (Del Norte)	Stallcup and Greenberg 1974
1981	1	?	Sardine Lake (Sierra)	LeValley and Evans 1981
1981	1	8	Butt Creek (Plumas)	LeValley and Evans 1981
1996	1	12	Wild Goose Club–Butte Sink (Butte)	CWA[a]
1997	1	10	Greenhead Land–Butte Sink (Sutter)	CWA
1997	1	0	Crim-Sky–Butte Sink (Butte)	CWA
1997–2001	1	?	(Siskiyou)	cited in Stallcup 2002
1997–2001	1	?	(Modoc)	cited in Stallcup 2002
1997–2001	1	?	(Trinity)	cited in Stallcup 2002
1997–2001	1	?	(Mendocino)	cited in Stallcup 2002
1997–2001	1	?	(El Dorado)	cited in Stallcup 2002
1998	1	3	Blue Lake (Humboldt)	CWA
1998	1	6	Berry Patch–Butte Sink (Sutter)	CWA
1998	4	24	Wild Goose Club–Butte Sink (Butte)	CWA
1998	2	9	Doty Creek (Placer)	CWA
1998	1	7	MacArthur (Shasta)	Roberson et al. 1998
1999	1	0	Lake Earl (Del Norte)	CWA
1999	1	7	Lake Sonoma (Sonoma)	CWA
1999	1	13	Big Lagoon (Humboldt)	CWA
1999	1	8	Crim-Sky–Butte Sink (Butte)	CWA
1999	2	15	Wild Goose Club–Butte Sink (Butte)	CWA
2000	4	28	Wild Goose Club–Butte Sink (Butte)	CWA
2000	1	6	Crim-Sky–Butte Sink (Butte)	CWA
2000	2	20	Big Lagoon (Humboldt)	CWA
2000	1	1	UC Davis (Yolo)	Terrill et al. 2000[b]
2001	8	42	Big Lagoon (Humboldt)	CWA, Roberson et al. 2001
2001	1	0	Eureka (Humboldt)	CWA
2001	1	12	Crim-Sky–Butte Sink (Butte)	CWA
2001	1	11	Berry Patch–Butte Sink (Sutter)	CWA
2001	3	24	Wild Goose Club–Butte Sink (Butte)	CWA
2001	1	?	UC Davis (Yolo)	CWA
2001	2	11	Grayson (Stanislaus)	CWA
2001	2	11	Antelope Lake (Plumas)	Singer et al. 2001, Stallcup 2002
2002	8	74	Big Lagoon (Humboldt)	CWA
2002	1	7	Clear Lake (Lake)	CWA, Glover et al. 2002
2002	6	36	Wild Goose Club–Butte Sink (Butte)	CWA
2002	10	19	Grayson (Stanislaus)	CWA
2003	8	194	Big Lagoon (Humboldt)	CWA
2003	1	10	Murdock Gun Club–Butte Sink (Colusa)	CWA
2003	7	42	Wild Goose Club–Butte Sink (Butte)	CWA
2003	5	54	Berry Patch–Butte Sink (Sutter)	CWA
2003	2	26	San Joaquin Wetlands Farms (Stanislaus)	CWA
2003	1	6	Sun City Lincoln (Placer)	Glover et al. 2003
2004	9	76	Simpson WDP (Humboldt)	CWA
2004	1	0	Crim-Sky–Butte Sink (Butte)	CWA
2004	1	0	Murdock Gun Club–Butte Sink (Colusa)	CWA
2004	6	76	Wild Goose Club–Butte Sink (Butte)	CWA
2004	3	22	San Joaquin Wetlands Farms (Stanislaus)	CWA
2004	1	8	Prado Basin (Riverside)	CWA, McCaskie and Garrett 2004

[a]CWA, California Waterfowl Association.

[b]Doubts about the native origin of the female were raised (Roberson et al. 2000).

tats including tidal marshes, sloughs, creeks, rivers, ponds, and lakes; these locations ranged in elevation from below sea level in the lower Sacramento Valley to 1585 m above sea level.

Monitoring of nest boxes began in mid to late February of each year and concluded in mid to late June, or until the fate of the last active nest was determined. Cooperators visited each nest box a minimum of three times over the course of a nesting season (following Allen et al. 1990, Henne and Hill 1990) and recorded occupancy and nesting information for all species of wildlife using the boxes. Data recorded included date of the visit, occupying species, number of eggs laid, number of eggs hatched, number of depredated or missing eggs, and number of hatchlings that did not exit the box. Cooperators determined the number of hatched eggs by counting the number of egg membranes left in a box after the chicks vacated it.

When possible, cooperators captured and banded nesting females during the second half of the incubation cycle (days 15–30) with standard U.S. Fish and Wildlife Service leg bands (master station permit #22063).

We considered a Hooded Merganser to have bred if we saw either unfledged young or at least one Hooded Merganser egg in a nest. A record of successful breeding required an observation of either unfledged young with an adult female Hooded Merganser or hatched eggs brooded by a Hooded Merganser. Hatched Hooded Merganser eggs brooded by a female Wood Duck were not considered evidence of successful breeding. From 1996 to 2004 the rate of Hooded Merganser parasitism of Wood Duck nests in the boxes monitored by CWA was 0.08% (21/25,668).

RESULTS AND DISCUSSION

The Hooded Merganser has been found nesting at least 119 times in California from 1964 to 2004 (Table 1). These birds produced more than 800 hatchlings distributed among 20 of California's 58 counties (Figure 1). Over 90% of those breeding attempts occurred between 1998 and 2004. With the single exception of a successful breeding in Riverside County in 2004, all have been in the northern half of the state.

Of these attempts, 64% were successful (76/119). To demonstrate that the apparent increase in reported successful breeding attempts represents a true increase and is not an artifact of an increasing number of nest-box reports, we normalized the number of successful breeding records from monitored nest boxes using the total number of nest-box reports. This analysis confirms that there has been a dramatic increase in breeding of the Hooded Merganser in California since 1996 (Figure 2).

Of the 231 sites throughout California where CWA monitors Wood Duck nest boxes, 16 (7%) reported the Hooded Merganser breeding. If a similar ratio applies to nest boxes other than those monitored by CWA, it is likely that breeding of the Hooded Merganser in California has become relatively common.

Studies in southeastern Missouri found that between 3.8 and 10.8% of female Hooded Mergansers return to their natal site to breed (Dugger et al. 1994). Strong fidelity to nest sites (29%) has been documented elsewhere in this species' range (Zicus 1990). Banding of female Hooded Mergansers

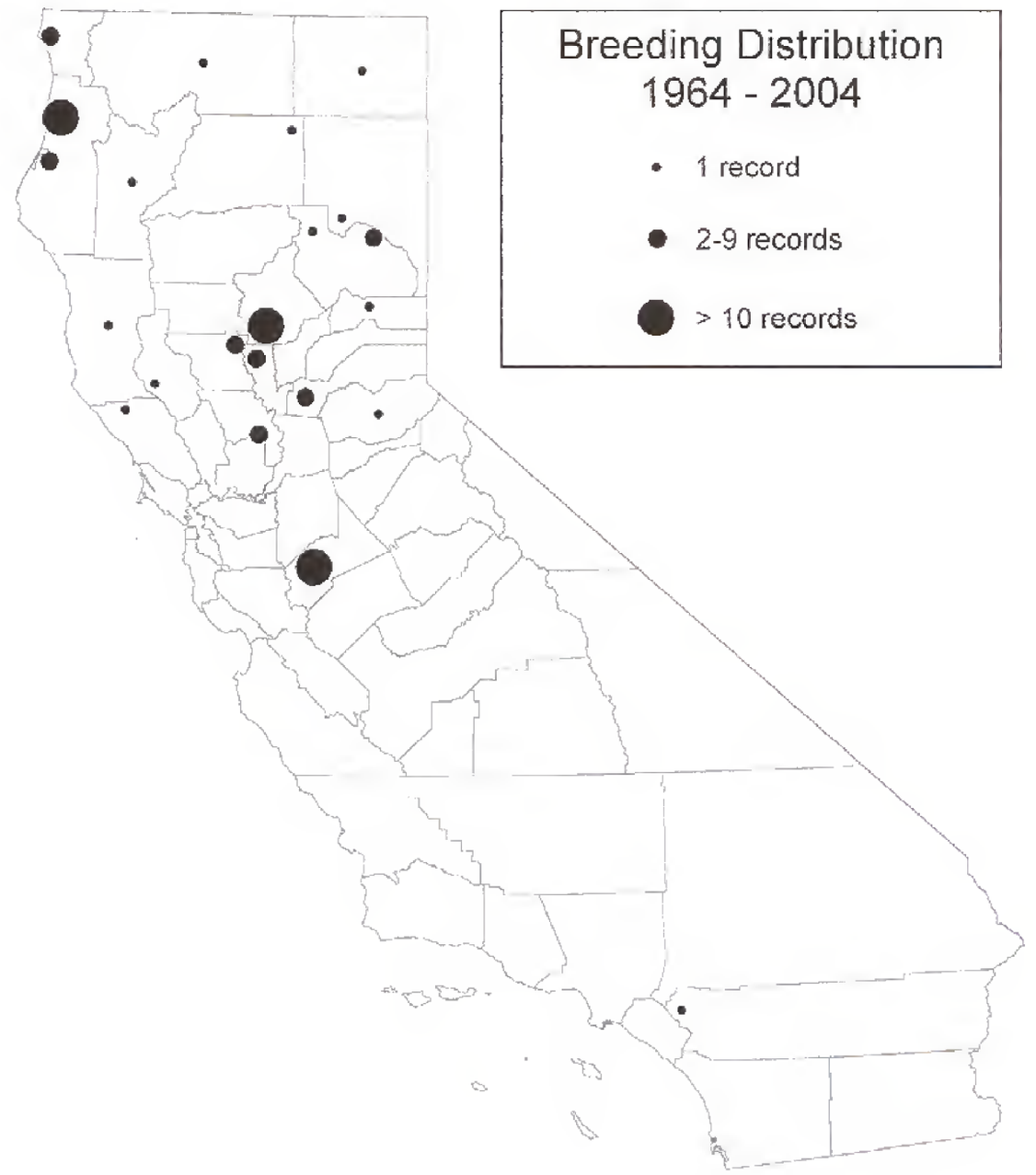

Figure 1. Locations of breeding attempts of the Hooded Merganser in California.

using CWA-monitored nest boxes showed a high degree of nest-site fidelity. Seven of the 19 females (37%) banded between 1997 and 2003 returned to nest in the same area in subsequent years, and two of those returned for five consecutive years. Strong nest-site fidelity combined with the likelihood of a significant degree of natal-site fidelity suggests that breeding of the Hooded Merganser in California may be sustainable into the future as long as suitable habitat is available.

Data from Christmas Bird Counts (CBCs) in California indicate that the winter abundance of the Hooded Merganser increased substantially over the last two decades (Figure 3), coinciding roughly with the increase in breeding records. The average number of Hooded Mergansers detected per party hour from 1982 to 2003 was significantly greater than that from 1960 to 1981

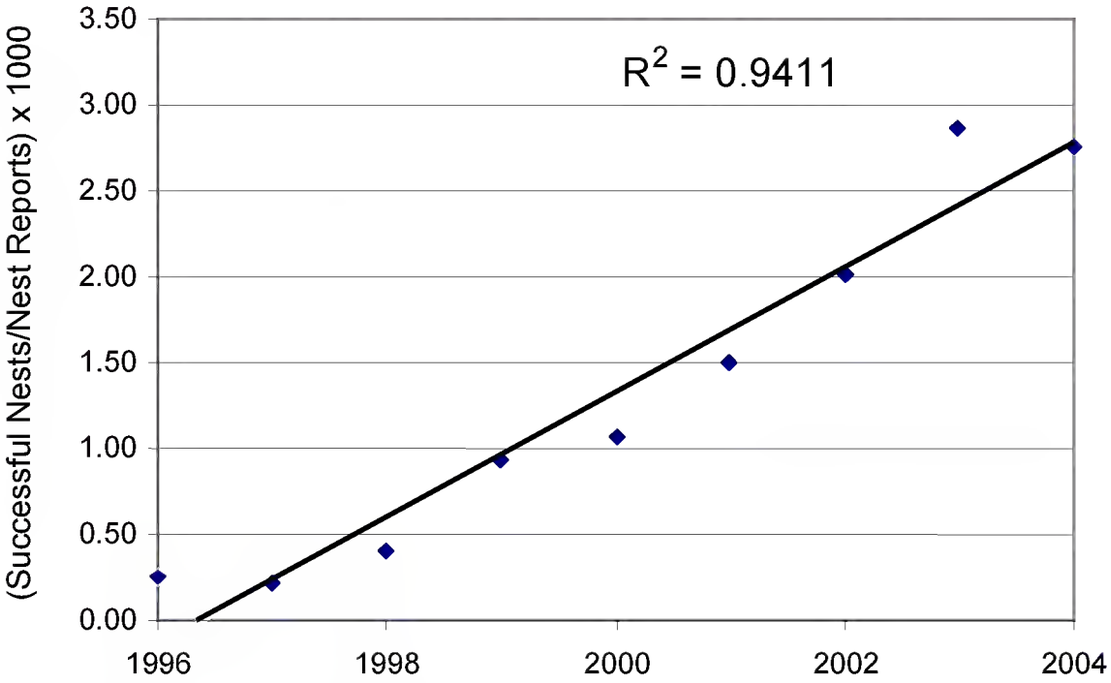

Figure 2. Scatter plot of the number of successful Hooded Merganser nests as a fraction of the total number of nest-box reports received by CWA, 1996–2004. The trend line is based on linear regression.

(*t* test; $p < 0.0001$). Moreover, two banded female Hooded Mergansers harvested during the hunting season were shot within 1 km of their banding site. Thus it appears that some of the breeding females winter near their nesting sites and that some of California's breeding Hooded Mergansers are now year-round residents.

Figure 2 shows that the increase in Hooded Merganser breeding began after 1998, while CBC data (Figure 3) suggest that the wintering population was increasing by the early 1990s. Therefore, it is possible that this increase in wintering Hooded Mergansers, combined with the increasing availability of nest boxes, provided females the opportunity to discover new nesting sites and helped drive the increase in breeding.

Range expansion and increased observations of the Hooded Merganser have been reported elsewhere in North America. Davis and Capobianco (2006) used CBC data to show an increase in the number of wintering Hooded Mergansers throughout the United States. An apparent population increase and range expansion has been reported in the northwestern portion of the range (Palmer 1976), around Yellowknife, Northwest Territories (Fournier and Hines 1996). Both nesting data and winter counts indicate an increasing population of the Hooded Merganser in Massachusetts (Heusmann et al. 2000). The latter authors noted that this trend in Massachusetts is supported in part by an increased number of Hooded Mergansers hatched in nest boxes. Dugger et al. (1994) noted breeding in the western United States outside the species' historic range in Oklahoma, Nebraska, and as far south as New Mexico. These have all been isolated occurrences, however, and do not seem to represent a true expansion of the normal breeding range.

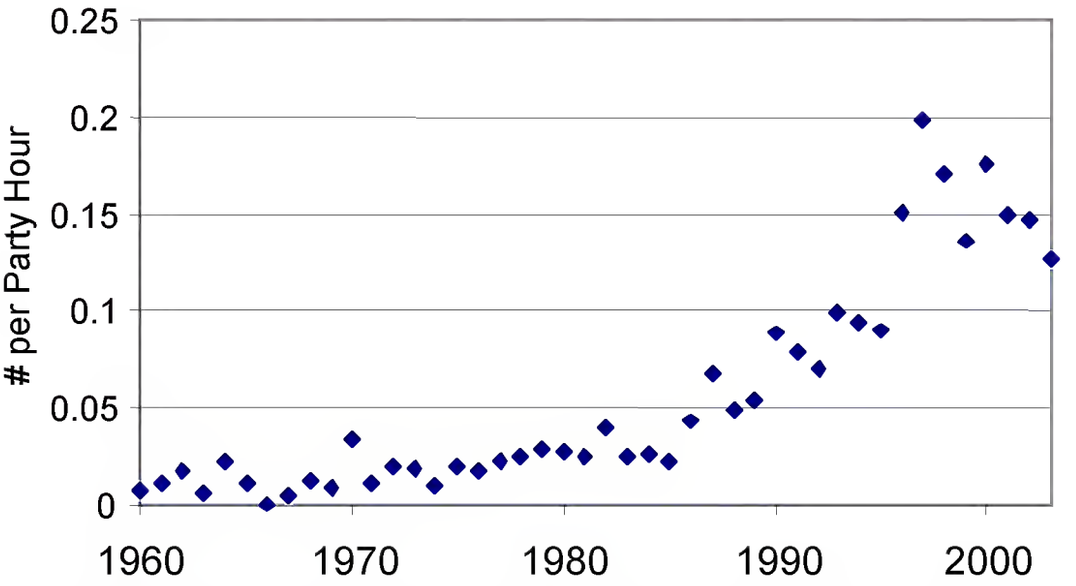

Figure 3. Scatter plot of the number of Hooded Mergansers found per party hour on California Christmas Bird Counts, 1960–2003.

Given the steady increase in records of successful breeding in California, their geographical dispersion, and the breeding-site and natal-site fidelity of female Hooded Mergansers, we conclude that the Hooded Merganser is now well established as a breeding species within California.

The possible implications of this range expansion for other species are unknown. It seems unlikely that the Hooded Merganser's breeding population would affect other species significantly. The number of Hooded Mergansers is very small in relation to the number of Wood Ducks. Hooded Mergansers could compete with other cavity-nesting ducks like the Bufflehead (*Bucephala albeola*) and Common Merganser (*Mergus merganser*), but these species breed primarily at elevations higher than the bulk of the Hooded Merganser's breeding sites in California.

We considered a number of factors that, singly or in combination, could account for the expansion of the Hooded Merganser's breeding range. These factors include

- changes in the rangewide or regional population
- an increase in suitable nesting habitat in California
- increased availability of nest cavities
- climate change

The overall population of the Hooded Merganser is believed to be stable or increasing (Dugger et al. 1994) and, as noted above, populations in the northwestern portion of the species' range appear to be increasing. Therefore, it is possible that this range expansion is due to female Hooded Mergansers being forced to explore beyond their historic range to find unoccupied breeding sites.

It is widely believed that, after many decades of decline, the forested wetlands used by breeding Hooded Mergansers in California have increased in recent years (L. Naylor pers. comm.). However, we could find no quantitative

data to confirm this. Programs like the U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program and the Natural Resources Conservation Service's Wetland Reserve Program have restored many acres of this habitat in the last 15 years, which may be a contributing factor to the increase of Hooded Merganser breeding.

Suitable nest cavities in California wetlands have increased with the installation of nest boxes for the Wood Duck over the past 50 years (Naylor 1960, Bellrose and Holm 1994), with more extensive and coordinated increases of nest boxes over the past 15 years (Kwolek 2004). While it seems likely that this is an important factor, it is not possible to speculate on the importance of nest boxes separate from other factors, because nearly all the data we cite come from nest boxes. Management practices that preserve snags and decadent trees cannot be overlooked as sources of increased nest sites for this species (Riparian Habitat Joint Venture 2004: http://www.prbo.org/calpif/riparian.v-2.pdf).

As noted by Richardson (2004) regarding the expansion of the breeding range of the Bufflehead in California, a southward range expansion is the reverse of the northward trend in breeding range noted by Thomas and Lennon (1999) and Root et al. (2003) for many other avian species. Richardson suggested that for the Bufflehead earlier spring thaws could be making more habitat available for this species in the Sierra Nevada. However, most of the breeding records for the Hooded Merganser are at lower elevations where this would not be a factor. Thus, climate change seems unlikely to be the cause of range expansion for the Hooded Merganser.

The expansion of the breeding range of the Hooded Merganser in California is likely due to some combination of the increase in suitable breeding habitat and nest boxes and the growth of the species' population in the western portions of its range. Richardson (2004) concluded that a similar combination of increase in habitat and nest cavities may have enabled the expansion of the breeding range of the Bufflehead within California.

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Family of Hooded Mergansers near Lincoln, Placer County, California.

Photo by Jack Ferrante

BOOK REVIEWS

Handbook of Avian Hybrids of the World, by Eugene M. McCarthy. Oxford University Press. 583 pages, 20 black-and-white figures (15 maps, 5 charts). Hardback $94.00 (ISBN-13-978-0-19-518323-8).

The importance of hybridism to ornithology has been debated. Certain hybrid combinations have critical implications to species conservation, for example, the swamping of the American Black Duck (*Anas rubripes*) and Hawaiian Duck (*A. wyvilliana*) by introgression with the Mallard (*A. platyrhynchos*). Others add insight to taxonomy and evolutionary biology, for example, contact among several closely related pairs of passerine species that have recently bridged the Great Plains. Whereas these and other cases of widespread hybridism are well studied, most avian hybrids seemingly have been produced by chance encounters, best viewed as anomalies. For the field ornithologist, such chance hybrids are at least an enlightening source of entertainment and may provoke in-depth discussions on species identification, plumage, vocalizations, molt, breeding behavior, and other aspects of avian natural history.

Over the years there have been several compilations of all known captive and "natural" avian hybrids, the most recent of these being the exhaustive treatment of Gray (1958, Bird hybrids, Commonwealth Bureau of Animal Breeding and Genetics, Edinburgh Technical Commission 13:1–390). New reports of hybrid combinations have increased substantially since Gray's oft-cited reference, so it was certainly time for another thorough compilation. McCarthy (hereafter also the *Handbook*) has done an admirable job, devoting 33 pages of introduction to both general and highly scientific discussions on all aspects of hybridism, listing approximately 4000 entries on reported or potential hybrid combinations around the world, citing about 5200 references and 200 Internet sites, and including a thorough index of scientific and English names. Detailed species accounts are included for well-documented, controversial, or important cases, such as Thayer's × Iceland gulls (*Larus thayeri* × *glaucoides*), Barred × Spotted owls (*Strix varia* × *occidentalis*), and Blue-winged × Golden-winged warblers (*Vermivora pinus* × *chrysoptera*). Anyone interested in avian hybridism will need the *Handbook*, and, because hybridism relates in some ways to almost all fields of avian interest, this book also provides an excellent resource for serious birders and ornithologists.

The hybrid combinations are listed in a 306-page section called "Cross Accounts," which are sectioned off into taxonomic "divisions," typically bird families as defined by Sibley and Monroe (1990, Distribution and Taxonomy of Birds of the World, Yale Univ. Press). When I first opened the book, to the ever-popular (when it comes to hybridism) wood-warblers, I noticed that *Dendroica* preceded *Vermivora* and that *Parula* fell between *Oporornis* and *Seiurus*. Had the American Ornithologists' Union (AOU) come out with a new supplement to its checklist? No. Rather, within each taxonomic division species are listed alphabetically by scientific name, a strategy I came to appreciate after just a few minutes of using the book. To save space, an account and the citations for each hybrid are listed only once, under the first parental species alphabetically, and are then cross-referenced under the second species. With increasing instability and confusion regarding "official" taxonomic sequences (e.g., Sibley and Monroe vs. the AOU, the latter now recommending new sequences every year), the listing of species alphabetically is a straightforward approach that results in a lot less difficulty in the search for a cross-referenced taxon. While it would have been of value to mention groups from which no hybrid combinations have been reported (e.g., storm-petrels, frigatebirds), and I have a few quibbles regarding the taxonomic divisions (see below), I believe that McCarthy has come up with the most strategic layout for ease of use.

Per chance, Steve Howell and I have recently completed an independent compilation of reported hybrids, involving 310 parental species of North American waterbirds,

raptors, and gallinaceous birds, to be published in *Identification Guide to North American Birds*, Part 2 (in press, Slate Creek Press, Bolinas, CA). While our aim was simply to furnish a list of peripheral interest, it also provided us a chance to cross-check the information we had gathered with that of the *Handbook* and to test the latter's accuracy and thoroughness. In both areas I give McCarthy high marks, although, as predicted in the *Handbook*'s preface, errors and omissions in a work of this magnitude are inevitable.

Of approximately 326 reported natural hybrids involving these 310 species, McCarthy listed 24 not found by us, whereas we found only six missed by him, such as the Black-crowned × Yellow-crowned night-heron (*Nycticorax nycticorax* × *Nyctanassa violacea*; Monson and Phillips, 1981, *Annotated Checklist of the Birds of Arizona*, Univ. of Arizona Press) and Xantus's × Craveri's murrelet (*Synthliboramphus hypoleucus* × *craveri*; van Rossem, 1939, Annals and Magazine of Natural History, 11th ser. 4:439–443). We also had found an additional five combinations that were undoubtedly published since the *Handbook* went to press, such as the Brown × Blue-footed booby (*Sula leucogaster* × *nebouxii*; Castillo-Guerrero et al., 2005, Western Birds 36:325–328), underscoring how quickly such works may become out of date. Some of those 24 combinations not found by us were based on unpublished communications or bird-ringing databases, the latter including a Cory's × Greater shearwater (*Calonectris diomedea* × *Puffinus gravis*) and a Bar-tailed Godwit × Red Knot (*Limosa lapponica* × *Calidris canutus*), combinations about which, without better documentation, I would have been a lot more skeptical than McCarthy seems. We had located about 40 references that were overlooked by McCarthy, not surprising given the extensive literature on avian hybrids. Most of these were obscure and of little significance, but some important works were also missed, e.g., Hubbard (1977, New Mexico Department of Game and Fish Bulletin 16:1–56) on Mexican Duck × Mallard introgression. More troubling were occasional lapses into misinformation; I found three cases among the 324 combinations checked. A full account on the Black-footed × Short-tailed Albatross (*Phoebastria nigripes* × *albatrus*) from Midway Atoll (no such hybrid is known there or anywhere) included eight references pertaining to the Black-footed × Laysan Albatross (*P. immutabilis*), which also received a separate full account. Similar errors include an indication that Ross's (*Chen rossii*) and Barnacle (*Branta leucopsis*) geese hybridize extensively in western North America (citing references on hybrids between the Ross's and Snow geese [*C. caerulescens*]), and that contact between vagrant Little (*Sterna albifrons*) and Least (*S. antillarum*) terns has produced natural hybrids, with a reference to a paper restricted to the subspecific taxonomy of the Least Tern.

McCarthy uses several codes to categorize hybrid combinations, such as natural vs. captive, extensive vs. limited, "on-going" or not, fertility status by sex, fertility and viability of hybrids, breeding-contact status, and several other miscellaneous categories. This information is extremely useful and well presented. I would have also preferred information indicating whether or not a parental population is native, such as the Canada Goose (*Branta canadensis*) hybridizing with the White-fronted Goose (*Anser albifrons*) in North America, or naturalized, such as the Canada Goose with the Barnacle Goose in Europe, as this dichotomy often bears on a species'conservation. In species where both captive and natural hybridization has occurred, splitting the references by these categories would also have been helpful.

I could not help but notice some minor transgressions in the area of consistency. McCarthy uses a format in which he crosses out hybrid combinations he feels have been insufficiently documented or erroneously reported. While this format is sound, it seems difficult to apply consistently. For example, some unique 19th century reports are questioned, others not. Most of these are listed in the main cross-accounts sections, whereas others are buried in an appendix of "dubious reports," when it would have been much easier for the user if all were in the main accounts. The taxonomic

divisions could have been more tightly constructed; for example, gulls and terns are lumped into one section despite no cross-subfamily hybrids, whereas the New World quails (family Odontophoridae) are separated from other gallinaceous birds (family Phasianidae) despite some cross-family combinations, which are not cross-referenced by page number and thus difficult to locate. There are accounts for several hybrids between subspecies, which are useful in cases of potentially incipient species among such taxa as the Mallard, Mew Gull (*Larus canus*), and Iceland Gull but seem out of place concerning the Black Rail (*Laterallus jamaicensis*), Rock Sandpiper (*Calidris ptilocnemis*), and Whiskered Auklet (*Aethia pygmaea*, erroneously listed as the Least Auklet, one of the few typographical errors I noticed). Conversely, the subspecies of the Green-winged Teal (*Anas crecca*, considered full species in some quarters) are not differentiated in the same way. Finally, some combinations, such as the White-tailed × Bald eagle (*Haliaeetus albicilla* × *leucocephalus*) and Marbled × Long-billed murrelets (*Brachyramphus marmoratus* × *perdix*) are listed with the information that no hybrids have yet been reported. Inclusion of subspecies and combinations for which no hybrids are known opens up large areas of potential inconsistency, and I suggest these cases be excised from the accounts.

These small criticisms do not detract from the overall quality and usefulness of this compilation and, best of all, would be easy to fix in what promises to be an on-going work. I encourage everyone noticing errors in the *Handbook* to contact the author at avian.hybrids@gmail.com, so that future editions of this important resource can be improved.

Peter Pyle

Birds of the World: Recommended English Names, by Frank Gill and Minturn Wright, on behalf of the International Ornithological Congress. 2006. Princeton University Press. 260 pages, Paperback plus CD, $19.95 (ISBN 0-691-12827-8).

Language, essentially an agreement of meaning for shared sounds and written words, is the keystone of human society. Yet Great Egret, White Heron, Common Egret, Great White Egret, American Egret, *Egretta alba, Ardea alba,* and *Casmerodius albus* are all names for one species of wading bird, and all are used in books on my shelf. While persons versed in nomenclature and taxonomy can figure out this synonymy, such heterogeneity doesn't really facilitate communication. Is there a solution? Does it really matter? Do you care?

With the view that standardized English bird names will promote success in ornithology and conservation worldwide, the International Ornithological Congress (IOC) in 1990 started a project that has culminated in this handy little book. The 11-page introduction sets out the process and principles involved and discusses problems of spelling, hyphenation, compound names, and the like. Even if you don't care about bird names, this introduction is well worth reading simply as an example of clear, concise prose. Then comes the list, ostensibly following the sequence of Dickinson (2003, *The Howard and Moore Complete Checklist of the Birds of the World*, 3rd ed., Princeton Univ. Press), with international English names, scientific names, and a précis of distribution by the six regions. An index and a CD inside the back cover complete the package; the CD allows for sorting (by spreadsheets) and gives more details of species' ranges.

This is the first truly international effort at standardizing English bird names—and no small undertaking. Subcommittees for each of six regions (Africa, Australasia, Palearctic, Oriental, Nearctic, and Neotropical) hashed out lists of names, and these were submitted for review and standardization. Consistency was desirable but not mandatory. Simplification, clarity, and unambiguity were the watchwords, tempered with a little common sense over choices, such as, for *Corvus corax*, between the parochial Common Raven and the more accurate Northern Raven (which is northern but is not common where most of the world's ravens occur) or, for *Caracara plancus*, between the parochial Southern Caracara (most caracaras are southern) and more helpful Southern Crested Caracara (associating it with the related Northern Crested Caracara, *C. cheriway*). The list is conservative overall, and has not been an excuse for widespread changing of inappropriate names. Still, a few "novelties" have been introduced, such as "Roughleg" (yuk!) for Rough-legged Hawk/Buzzard (*Buteo lagopus*), where apparently it was impossible to reconcile transatlantic constituencies. Or the sexier Blue-throated Mountain-gem for the Blue-throated Hummingbird (*Lampornis clemenciae*; other species in the genus *Lampornis* are mountain-gems, and there are hundreds of just plain "hummingbirds").

Beyond potential changes in rules for hyphenation (which, I cede, make sense in this context), how does this new list affect North American birds? Well, not at all unless you want to adopt the suggestions, or unless the American Ornithologists' Union adopts some or all "new" names and the sheep that we are follow blindly. Other potential changes for North American species (in addition to those noted above) include Sage Grouse (*Centrocercus urophasianus*) and Gunnison Grouse (*C. minimus*), Great Northern Loon for the Common Loon (*Gavia immer*), Cahow for the Bermuda Petrel (*Pterodroma cahow*, and see below), Great Shearwater for *Puffinus gravis* (there are, after all, more than two species of shearwaters), American White Ibis for *Eudocimus albus*, Grey Plover for the Black-bellied (*Pluvialis squatarola*, and yes, the IOC went with "grey" over "gray," implying inconsistency with every work edited in standard American English), Pomarine Skua (vs. Jaeger for *Stercorarius pomarinus*), American Black Swift for *Cypseloides niger*, Sand Martin for the Bank Swallow (*Riparia riparia*), American Cliff Swallow for *Petrochelidon pyrrhonota*, Common Starling for *Sturnus vulgaris*, Buff-bellied Pipit for the American Pipit

(*Anthus rubescens*), Painted Whitestart (vs. Redstart for *Myioborus pictus*), and Nelson's Sparrow (*Ammodramus nelsoni*) and Saltmarsh Sparrow (*A. caudacutus*). So, not too many concessions from the American side, really—and the Brits have to deal with loons instead of divers and jaegers instead of skuas for the Parasitic (*S. parasiticus*) and Long-tailed (*S. longicaudus*), among others.

Inevitably, some of my preferred names fell by the way, and I call the IOC to task on its claim of local vernacular names not prevailing over established formal names. For example, what is a Pediunker? If instead I said Gray (Grey?) Petrel, you could probably figure out what type of bird it is, as well as its predominant color, if you didn't go immediately to *Procellaria cinerea*. Then again, Black Petrel (for *Procellaria parkinsoni*) is not too helpful, and I find the name Parkinson's Petrel preferable. Many seabirds are wide-ranging species not well suited to parochial names. And only the most emotionally castrated human, one who has never experienced the wonders of the Southern Ocean, could ever render the ethereal Light-mantled Sooty Albatross (*Phoebetria palpebrata*) down to Light-mantled Albatross. But, other than failing to have a cognizant seabird subcommittee, I would say the IOC did as good a job as one could hope for. And, as it states, the adoption of these names is voluntary, and this list is an ongoing work.

So, until aliens visit us from other worlds with birds (Pluto House Sparrow versus Earth House Sparrow?), the IOC list of *Recommended English Names* is a good starting point and deserves serious consideration by persons interested in communicating. And, as Tom Lehrer once said, "If a person can't communicate, the very least he can do is to shut up...."

Steve N. G. Howell

FEATURED PHOTO

PRIMARY MOLT IN THE BLACK-FOOTED ALBATROSS

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Molt is a critical part of every bird's life history, but there is a limit to the rate feathers can grow, which is about 4 to 10 mm/day in large birds (Prevost 1983). Hence some large and long-winged birds may have insufficient time between breeding seasons for a complete molt of their wing feathers, particularly the primaries (Langston and Rohwer 1996, Rohwer 1999). Molt of the primaries in most birds is sequential, from the innermost (primary 1, or p1) out to the outermost (usually p10), but some variations on this theme have developed in long-winged birds, so that they can fly more efficiently during molt. For example, the molt of albatrosses involves splitting the primaries into series. In the Black-browed (*Thalassarche melanophris*) and Gray-headed (*T. chrysostoma*) albatrosses, the outer three primaries are molted every other year, and some inner and middle primaries are molted every year (Prince et al. 1993). In the Black-footed (*Phoebastria nigripes*) and Laysan (*P. immutabilis*) albatrosses, the outer three primaries are usually molted every year, along with no to all inner and middle primaries (Langston and Rohwer 1995; pers. obs.). Year-to-year differences in the extent of primary molt reflect combinations of variation in the bird's age, breeding status, and food supply (Prince et al. 1993; Table 1).

Langston and Rohwer (1995) concluded that the primaries of Black-footed Albatrosses molt in two series: from a node at p6 outward to p10, and from a node at p5 inward to p1. In the outer series, p8–p10 are always replaced, but p7–p6 are not. In the inner series, from no to all primaries are replaced in a "wraparound" pattern; that is, a p5-inward-to-p1 sequence is maintained from one molt cycle to the next,

Table 1 Primary Molt of Eight Black-footed Albatrosses Captured 19–20 July 2005 at Cordell Bank National Marine Sanctuary, Marin County, California

Bird	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10
704	O[a]	O	O	O	O	O	O	N[b]	90%[c]	65%
706	N	N	N	N	N	O	O	N	85%	30%
707[d]	O	O	O	O	O	O	O	O	95%	X[e]
708	N	N	N	N	N	N	N	N	75%	30%
709[d]	O	O	O	O	O	O	O	O	95%	45%
710	O	O	O	O	O	40%	45%	O	O	O
711	N	O	O	O	N	N	N	N	55%	25%
712	N	N	N	N	N	N	N	N	95%	25%

[a]O, feather one or two cycles old.

[b]N, feather newly replaced;

[c]Feather growing; percentage is a rough estimate of the fraction of the feather's full length beyond the primary-covert tips.

[d]Bird evidently in its second calendar year of life; molt being limited to p9 and p10 may reflect a year of poor food supply in the California Current (PRBO unpubl. data).

[e]X, feather shed or just starting to grow (not visible in photos).

so that replacement starts up again where it left off and the oldest feather is always replaced first. Subsequently, however, Edwards and Rohwer (2005) suggested that the inference of a wraparound pattern was an artifact of failing to recognize that the outer secondaries are part of a molt series that includes p1; they continued to treat the remaining primaries as split into series at a p5/p6 break.

From my observations of primary-molt patterns in albatrosses, I contend that the data used to support a p5/p6 break in the Black-footed Albatross are equivocal. I suggest, instead, that the molt sequence for the inner and middle primaries of all birds in table 6 of Langston and Rohwer (1995) can be interpreted as an inward stepwise molt that originates with p7. In stepwise molt, waves of molt move through a series of primaries, with successive waves starting before preceding waves have completed; thus the bird may be wearing at least three generations of primaries at one time. The stepwise molt I propose for the Black-footed Albatross differs from typical stepwise molt (which runs from p1 outward to p10) in starting with p7 and moving inward. Because p7 is the most exposed primary in the inner series, it can be replaced in preference to the innermost primaries, which experience relatively little wear and can be retained for two molt cycles (Table 2). I agree with Edwards and Rohwer (2005) that the wraparound molt is a spurious concept: figure 4 of Langston and Rohwer (1995) shows p1–p2 to be replaced more often than p3–p5, but in a wraparound pattern p5 should be replaced at least as often as the other primaries. P1–p2 being replaced more frequently than p3–p4 (figure 4 of Langston and Rohwer 1995) suggests a third (outward-molting) node at p1, or, as argued by Edwards and Rohwer (2005), perhaps p1 is aligned in a molt series with the outer secondaries. The Laysan Albatross (*P. immutabilis*) follows the same pattern that I report for the Black-footed (based on data in Langston and Rohwer 1995).

Langston and Rohwer (1995, table 6) had 11 actively molting specimens from which to infer directions of primary molt by the Black-footed Albatross, and none of

Table 2 Lengths of Primaries from Table 6 of Langston and Rohwer (1995) Expressed in Millimeters Rather Than as Percentages[a]

	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10
Full length[b]	147	157	173	196	226	257	281	303	311	299
Bird										
12	O[c]	O	O	O	143	177	194	164	o[d]	o
145	O	O	O	O	38	57	28	o	o	o
171	O	O	152	172	206	218	194	30	o	o
16	O	O	138	157	192	231	28	o	o	o
25	O	O	166	188	224	252	o	o	o	o
289	O	55	154	174	203	o	183	61	o	o
98	1	93	138	157	217	O	219	88	o	o
154	29	N[e]	N	N	N	N	N	o	280	90
306	O	16	N	N	N	N	273	85	o	o
84	122	o	o	o	N	N	28	282	131	o
97	29	O	N	N	N	N	N	242	62	60

[a]All primaries grow at the same rate (Langston and Rohwer 1996), so longer feathers were shed before shorter feathers.

[b]Mean, from table 6 of Langston and Rohwer (1995)

[c]O, feather two cycles old.

[d]o, feather one cycle old (replaced in last molt).

[e]N, feather newly replaced.

these offers an unequivocal answer as to where the molt series break. I also examined spread-wing photos of eight Black-footed Albatrosses captured 19–20 July 2005 for satellite tagging (Table 1). These photos (birds 710 and 711 are shown on this issue's back cover) allow new, old, and growing primaries to be distinguished. But, as with data in table 6 of Langston and Rohwer (1995), interpretations of the molt pattern and series break in these photos can be equivocal. The lower photo on the back cover (of bird 711) exemplifies the difficulty of inferring molt sequences unless critical feathers are molting: it has p9–p10 completing growth, p8–p5 fresher-looking and blackish, thus newly replaced (but somewhat disheveled at the tips from handling), p4–p2 more faded and brownish, thus retained (probably one cycle old), and p1 newer-looking than p2–p4, perhaps newly replaced or perhaps one cycle old. I interpret this as an arrested inward wave from p7 and a complete outward wave from p8; whether p1 was molted as part of a different series cannot be determined. But molt in this individual could also be interpreted (following Langston and Rohwer 1995) as a complete outward wave from p6 to p10 and an incomplete wraparound molt within p1–p5. I also checked specimens (see acknowledgments) in search of birds molting these critical feathers, but only one bird (San Diego Natural History Museum 38861) was potentially informative: it was starting primary molt on 16 June, with p7 recently having been shed and the other primaries yet to molt. My data, together with a review of Langston and Rohwer's (1995) data (in the following paragraph), suggest that the molt break occurs between p7 and p8 rather than between p5 and p6.

Bird 12 (of Langston and Rohwer 1995, see Table 2) has an inward wave starting at p7 and an outward wave starting at p8. Bird 145 has an inward wave that started at p6 and a second inward wave starting at p7. Bird 171 has an inward wave that started at p6, a second inward wave starting at p7, and an outward wave starting at the recently shed p8. Bird 16 has an inward wave that started at p6 and a second inward wave starting at p7. Bird 25 has an inward wave that started at p6 (with p7 not yet shed). Bird 289 has an inward wave that started at p5, a second inward wave starting at p7, and an outward wave starting at p8. Bird 98 has inward waves that started at p7 and p5 and an outward wave starting at p8. Bird 154 has an inward wave that ran from p7 to p1 and an outward wave starting at p9 (p8 was skipped). Bird 306 has an inward wave starting at p7, a second inward wave that started at p6 has reached p2, and an outward wave is starting at p8. Bird 84 has an arrested inward wave that started at p6, a second inward wave starting at p7, a wave at p1, and an outward wave that started at p8. Bird 97 has an inward wave that started at p7, a wave at p1, and an outward wave starting at p8.

The upper photo on this issue's back cover shows a bird (number 710 in Table 1) whose molt is inconsistent with a break between p5 and p6: in this bird p8–p10 and p5–p1 are old, and p7–p6 are growing. Because p7 is longer than p6 it is logical to conclude that p7 was shed first. It is ambiguous whether p7 represents the start of an inward-molting wave (which I believe it does) or an outward-molting wave (with p6 starting the inward wave). Either way, the molt series are not split between p5 and p6.

From the above, I infer that p5–p7 typically molt inward from p7 and that p6–p7 are not part of an outer series. My observations support Langston and Rohwer's (1995) data for the annual, outward molt of p8–p10 by almost all birds (a few individuals, perhaps mainly first-year birds, replace only p9–p10; Table 1). If only p8–p10 are replaced, then molt is outward from p8 to p10; if inner and middle primaries are also replaced, then molt often starts at p7 and moves inward, sometimes as far as p3, before p8 is shed as the start of an outward wave; p9–p10 are often shed in close succession and grow simultaneously (e.g., lower photo on this issue's back cover). Further study of birds in molt is needed before molt series in the primaries of the Black-footed Albatross can be identified unambiguously, but observers now have an alternative hypothesis to consider.

Interestingly, a break between p7 and p8 corresponds to the pattern reported for the Black-browed and Gray-headed albatrosses, in which p8–p10 are molted outward every other year, and a second wave molts inward from p7 (Prince et al. 1993); a third (outward-molting) wave can also start at p1 in at least the Black-browed and Wandering (*Diomedea exulans*) albatrosses (Prince et al. 1993, 1997). Because molt sequences of the primaries are fairly conservative (P. Pyle pers. comm.), it would not be surprising if the Black-footed and Laysan albatrosses shared a common molt strategy with the southern albatrosses.

The frequency of molt of the outer primaries in albatrosses may reflect environmental conditions. In *Phoebastria*, abrasion by sand on the nesting islands and the effects of strong tropical sunlight may necessitate annual replacement of the outer primaries (whose tips are exposed on the closed wing), which is facilitated by molt occurring during fall in the productive California Current. By contrast, the high-latitude lifestyles of *Thalassarche* do not bring these species into contact with intense sunlight, and their primaries molt during midwinter, a potentially less favorable time (Prince et al. 1993); hence, they are able to replace the outer primaries only every other year.

I thank Shearwater Journeys and the Cordell Bank National Marine Sanctuary (CBNMS) for enabling me to see numerous Black-footed Albatrosses at sea; Oikonos (particularly Michelle Hester and Carol Keiper) for sharing their photos and data on birds captured at CBNMS, Marin County, California; personnel at the San Diego Natural History Museum (Philip Unitt), California Academy of Sciences (John P. Dumbacher, Maureen Flannery), and Museum of Vertebrate Zoology, University of California, Berkeley (Carla Cicero) for access to specimens; and Peter Pyle and Sievert Rohwer for their thoughtful comments on this note.

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FEATURED PHOTO

REPLY TO HOWELL ON PRIMARY MOLT IN ALBATROSSES

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In the Laysan and Black-footed Albatrosses the inner and outer primaries are replaced in opposite directions, making it clear that they are part of separate molt series. Howell (2006) argues that Langston and Rohwer (1995) were wrong about the location of the division between these molt series. While Langston and Rohwer interpreted this division as lying between primaries 5 and 6 (P5/6), Howell (2006) suggests that this divide lies between P7 and 8. Howell further posits that the mode of feather replacement in the inner primary series is stepwise, meaning that multiple waves of active feather replacement sometimes proceed simultaneously through the inner primaries.

There are four fundamental problems with Howell's (2006) arguments. First, he ignores previously published data on direction of feather replacement; second, he fails to take into account age-class differences in the number of primaries replaced, as well as year to year variation in the number of outer primaries that adults replace; third, he interprets feather replacement patterns in fields of new or old feathers, even though this is unhelpful because feather replacement in such wings can be interpreted in multiple ways; and fourth, he ignores published evidence that stepwise replacement does not occur in the inner series of primaries (Edwards and Rohwer 2005). We elaborate on each of these points below.

Previously published data on the direction of feather replacement fail to support Howell's proposal that the divide between the inner and outer primaries lies at P7/8. Howell recognizes that replacement of the outer primaries of Laysan and Black-footed Albatrosses proceeds distally, while replacement of the inner primaries proceeds proximally, and he cites Langston and Rohwer (1995) in support of this observation. But he fails to use the data presented by Langston and Rohwer to evaluate critically the very molt divide that he proposes. If P7/8 were a molt divide, then P7 and P8 would each be nodal feathers starting feather replacement in their respective molt series, at least when molts are extensive. Thus, under Howell's hypothesis of a P7/8 divide, any directionality between P7 and P8 would indicate only the sequence of activation between the inner and outer molt series in the primaries. But Howell's placement of the break at P7/8 makes the clear prediction that the direction of replacement between P6 and P7 should be distal to proximal. Yet, for cases where P7 is growing Langston and Rohwer (1995) showed the direction of replacement was proximal to distal in seven cases and distal to proximal in only one case (Langston and Rohwer 1995: table 6). These directionality data refute Howell's supposition that the divide between the inner and outer primaries in these albatrosses lies at P7/8.

The second problem with Howell's interpretation involves the fact that five of the eight birds in his table 1 are replacing only their outer two to four primaries. First-time molters usually replace just their three outer primaries (some replace just the outer two primaries, and a few replace the outer four primaries). This is analogous to the eccentric molts of primaries in many first-year passerines (Rohwer 1986, Pyle 1997). Furthermore, adults often replace only their three outer primaries in years when they undergo limited molts (Langston and Rohwer 1995). Two important implications follow from these facts. First, any effort to distinguish between molt divides at P7/8 versus P5/6 must exclude birds undergoing limited molts of just the outer two to four

primaries (molts starting at P7, P8, or P9) because such birds cannot help distinguish between alternative molt divides at P7/8 or P5/6. Further, if one examines mostly birds replacing just their outer primaries, without being critical about their age, it is easy to get the misimpression that the molt divide lies at P7/8 because almost all juveniles (as well as many adults) will be replacing only these outer three primaries.

Langston and Rohwer (1995) were able to identify first-time molters by their large bursas and by the absence of old feathers among their inner primaries and their many secondaries. North Pacific albatrosses retain their bursas for several years (Broughton 1994), so the presence of a bursa fails to distinguish between birds that are in their first, second, or third molt cycle. But birds that have (1) a large bursa, (2) outer primaries in molt, and (3) inner primaries and secondaries that are all the same age can be inferred to be undergoing their first molt of primaries, meaning that they are about a year old. This aging criterion works because the flight-feather molt of Laysan and Black-footed Albatrosses is essentially never complete, meaning that the 30 to 50 inner flight feathers of the wing will always contain two or more age classes of feathers in older birds (Langston and Rohwer 1995). Because most young birds replace only the outer three primaries in their first primary molt, and because adults often restrict replacement of outer primaries to these same three feathers, locating the molt divide between the inner and outer primaries requires examining adults undergoing extensive primary replacement, exactly the birds presented by Langston and Rohwer (1995) in their table 6. Howell offers only a single additional bird that is relevant to distinguishing between a P7/8 molt divide and a more proximal molt divide; this bird, number 710, supports a divide at either P7/8 or P6/7. Thus it contradicts Langston and Rohwer (1995) but offers only equivocal support for Howell (2006).

The third problem with Howell's (2006) critique is that he interprets feather-replacement patterns in fields of new or old feathers, even though feather replacement in such wings can be interpreted in multiple ways and is unhelpful, a point that Howell acknowledges. Thus he interprets his bird 711 as consistent with both of our hypotheses, meaning that it fails to distinguish between the hypotheses and is unhelpful. He considers as potentially informative San Diego Natural History Museum 38861, which was starting its molt at P7, but this bird could be consistent with a break at P7/8, P6/7, or P5/6, given the frequency with which middle primaries are skipped (Langston and Rohwer (1995). Howell reinterprets all 11 of the Black-footed Albatrosses reported in table 6 of Langston and Rohwer (1995), but only a single specimen contradicts our hypothesis of a P5/6 divide and supports Howell's P7/8 divide. All others fail clearly to support his hypothesis that the divide lies at P7/8.

Finally, many wings in Langston and Rohwer's (1995) table 6 are incompatible with Howell's (2006) proposed P7/8 divide without additional suppositions. To explain these birds Howell (2006) suggests that the mode of replacement in the inner primaries is stepwise. With this added complexity, Howell's paper joins a long history of speculation about stepwise replacement of primaries in albatrosses that seems based exclusively on intermixed blocks of old and new primaries (e.g., Prince et al. 1993, Furness 1988, Brooke 1981, Harris 1973). Stepwise feather replacement simply cannot be assessed without first defining the molt series to which this mode of replacement applies (Shugart and Rohwer 1996, Rohwer 1999). Once the molt series is defined, documenting stepwise molting further requires demonstrating that two or more waves of feather replacement are proceeding simultaneously through the series. Using the term "stepwise molting" in the absence of such data amounts to diluting its definition to meaning nothing more than the presence of at least three intermixed blocks of old and new primaries in a wing. Unfortunately, it is not particularly helpful to interpret exceptional birds as undergoing stepwise replacement of their inner primaries if the molt series itself is not clearly defined; pointing out doubt about this later point was exactly the purpose of Howell's (2006) paper.

As Edwards and Rohwer (2005) showed, the abundance of feather skipping within

molt series in these North Pacific albatrosses means that stepwise molting can be assessed without error only by using birds in active molt. Intermixed blocks of new and old feathers may arise (1) because the feathers being examined are really part of two separate molt series, or (2) because of feather skipping (no temporal overlap between groups of growing feathers in the same series), or (3) because of stepwise replacement. Assuming a P5/6 break between the inner and outer primaries of Laysan and Black-footed Albatrosses, Edwards and Rohwer (2005) found no case of multiple simultaneous waves of active replacement in the primaries. Further, there is still no case of this in our data (Langston and Rohwer 1995: table 6) if we assume the boundary is moved to P6/7, which we cannot distinguish from P5/6 (see below). In contrast, there is good evidence of two waves of primary replacement if the series boundary were at P7/8, but we have already shown that directionality data refute this divide. Thus Howell's (2006) stepwise replacement is an artifact of having the series boundary in the wrong place. So far as we know, there remains no proof for any albatross that stepwise molting occurs in any subset of the primaries. In contrast, stepwise feather replacement does appear to be the case for the two inner molt series that include only secondary feathers (Edwards and Rohwer 2005).

In spite of its problems, Howell's (2006) paper convinced us that past versions of the molt-summary tables advocated by Rohwer and his collaborators have been so complicated that they were inaccessible to most readers (see examples in Langston and Rohwer 1995, Shugart and Rohwer 1996, Yuri and Rohwer 1997). Thus, in a separate paper, we propose a far simpler method of scoring the direction of feather replacement; this new method limits directionality scoring to adjacent pairs of feathers, thus eliminating the "ambiguous direction" category of earlier papers (Rohwer and Edwards unpubl.). The surprise of this innovation is that we have discovered that there are two alternative locations for the divide between the inner and outer molt series in the primaries of Laysan and Black-footed Albatrosses and that these alternatives cannot be distinguished with present data. One possibility is a divide at P5/6 (slightly less plausible); the other possibility is a divide at P6/7 (slightly more plausible). In light of this discovery it is interesting to note that most of the potentially contradictory specimens cited by Howell become consistent with a divide lying at P6/7, without invoking stepwise replacement in the inner primaries. Thus bird 710, the upper on this issue's back cover, represents an exception to Langston and Rohwer's placement of the divide between P5/6. But this bird is consistent with the alternative P6/7 divide recognized in our new analysis (Rohwer and Edwards unpubl.), as well as with the P7/8 divide hypothesized by Howell (2006).

As much as we were frustrated by the need to reply to Howell, we would not have discovered this simpler method of summarizing molt data had Howell not written his paper. For that we are grateful. Hopefully this simpler method will inspire others to publish quantitative molt-summary tables that illustrate and support their conclusions about the rules of flight feather replacement.

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Family of Hooded Mergansers (*Lophodytes cucullatus*) just east of Lincoln, Placer County, California, 17 April 2005.

Photo by Jack Ferrante

Northern Fulmar (*Fulmarus glacialis*), Gulf of Alaska, 10 May 1998.

Photo by Robert H. Day

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Back cover "Featured Photo" by © Carol Keiper of Benicia, California: Wings of Black-footed Albatrosses (*Phoebastria nigripes*), July 2005.